Making a Calculator Keyboard Overlay

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You have an HP calculator that is programmable, or permits key assignments, and you would like to make a keyboard overlay to indicate the new functions. The new HP 30b financial calculator is programmable in the sense that it provides a macro capability. The programming functions are not provided on the keyboard so you need an overlay to show them.

The tools you will need to make a calculator overlay are a scanner, and an image processing program. The tools used for this article is an HP Photosmart C4150 All-In-One printer + scanner + Copier, and Jasc Paint Shop Pro (V 7.04).

Keyboard overlays are troublesome items. They are somewhat fragile and they never seem to be at hand when you need them. Aside from these handling and storage issues you naturally want to keep them to a minimum. If your overlay is symmetrical you may print key notations both sides. One side is printed with normal keyboard notations and the other side is printed with your custom keyboard notations. You simply flip the overlay as needed.

The HP 30b calculator has a double wide INPUT (ENTER) key and this requires that the keys at the opposite end of the INPUT key row be cut the same width to make it symmetrical for flipping. See an example in figure one.

The first step in creating a keyboard overlay using a photo editor program is to scan the keyboard. We used a resolution of 600 pixels per inch but you may get by with 200 or 300. We wanted a fine line that would be less obvious if it is missed when the key areas are cut out from the printed overlay.

Portions of the calculator image in figure two are not sharp (e.g. the printing at the top) because the calculator keyboard is not flat. This is not important for our purposes. After you scan the calculator being very careful to make it straight (to save you lots of work later) you will use this full scale image to create the key outlines as a line drawing. If you don't want to have to make multiple straightening scannings you may rotate the scanned image to less than 0.1 degree about the center of the image so making an image "straight" is quite easy. You want the keys to be aligned and straight to the nearest pixel.

Once you have a scanned image opened it in PSP so you may begin to make the boxed key cutouts. The purpose of this article is to



Fig. 1 – Example of HP30b overlay.



Fig. 2 – Scanned calculator keyboard.

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provide the basic process of creating a keyboard overlay. We assume that you are familiar with Paint Shop Pro, or with what ever image editing program you are using, to accomplish the illustrated steps. We will give some of the keyboard commands for PSP to simplify the process. Zoom in (2:1) on the first key



Fig. 3 - Key is color selected to be made into a white framed box.

in the first row and use the magic wand $tool^{(1)}$ (set to 50%) to select the darkest portion of the key. We used the space below the "N." Figure three shows the dotted lines that represents the selected color. You then press CTRL + "C" to copy that selection and CTRL "V" to paste that selection into a new image. Merge (flatten) all layers.

You next select the whole key image, with white as the back ground color, and then delete it. You now have a white rectangle of the approximate size of the key⁽²⁾. The next step is to put a black frame (background color) around this white area by using the Add-Borders function and clicking on the symmetrical box. Set the value to a single pixel (or two if you want really bold lines).

The resulting image will look like this; \square The next step is to copy the box onto the "clip board." Now go back to the keyboard

image and set the grid settings horizontal and vertical to 0.01 inches and select "snap to grid." Now paste the box using CTRL + E and move it on top of the key as shown in figure four. The grid lines will help you keep your boxes in nice straight rows and columns. Continue pasting the box onto the next five keys in the row.

The keys in the next row are the same size so repeat the process for these six keys turning the grid lines on and off as needed to be sure you are working in the right area of the image. An alternate method is to copy the whole row of boxed key cutouts and past it on top of the second row of keys in the scanned (Fig. 1) image.

Note that the next (3rd) row of keys has a "double wide" key and the other keys in the row are narrower than the ones just processed. This means that you need to make another boxed frame image.

Repeat the selection process shown in figure three to put a new box onto the clip board. When you paste the first box onto the INPUT key slide it to the upper left edge of the INPUT key. Paste another framed box and slide it to align with the upper right edge of the wide key. You will have a strip between these two boxes. Use the selection tool to select a portion within the framed box extending above and below the box a few pixels and copy and paste it over the stripe between the two framed boxes. Obviously the INPUT key is much wider than twice as wide as a single key because it includes the space between the keys. Paste a framed box over the next two keys going to the right. Next copy the INPUT key box and paste it over the two last keys in the row for the "wide cut key" shown in figure one.



Fig. 4 – Example of HP 30b overlay.



Fig. 5 – *Key cutouts and selected area of figure one is cropped.*

The next groups of four key rows are all the same size. Repeat the process described above and make a third boxed frame. See figure five. When you have a row completed you may copy the row and paste it on the last three rows of keys. Be very careful to keep everything straight and aligned to the nearest pixel. We usually work at 3X during this process. Be sure to use the grid lines.

The nearly finished keyboard overlay as shown in figure five has been cropped to only the approximate size of the keyboard area it will fit. It has been intentionally made a little wider. The finished outside dimensions will be determined in the final cropping before adding the frame. You will need to print this image several times during the process as a reality check on how things are going.

Also note that the single notation on the keyboard ("Black S") has been "removed" by selecting a portion of unprinted space and pasting it on top of the lettering. You will type this notation back when you actually make the final printed overlay.

Save the three boxed frames for future use if you wish. They will only be used if you need to adjust the boxes after you cut a few overlays and check all positions and dimensions. It is a simple process to make them a few pixels wider or taller and redo them. Having a saved reference to work with is easier because we are not working with actual measurements, only pixels.

The next step is to remove the brushed gray spaces between the boxed keys. There are at least two ways of doing this. One is to use the magic wand and selecting the space and deleting it with white as the background. This is not very clean and we prefer the more time consuming method of selecting the various spaces and deleting them. Here is where having the key rows and columns properly aligned pays off. See an example in



figure six. The space above the top row of keys and the column Fig. 6 - Making space between keys white.space between the first two keys has been selected and deleted. Repeat for all gray areas.

Also note the very fine lines that this 600-pixel-per-inch resolution produces. In essence this method of making the overlay produces a line drawing. Drawing programs are expensive and we use this method because we use PSP extensively and we tend to use what we have and what we are familiar with.

Once you have all the gray areas made white you may determine the final width and height of the overlay. You may want a some space above the overlay to use a little clear tape to secure the overlay, for example. In this case you will crop the top tighter. The sides of the HP 30b are curved and you should actually cut an overlay to see how it fits the keys before deciding on the width. It is a trial and error process, but once you are done you may make as many different overlays as you wish by using your finished product as a template.

Figures seven and eight show how the finished keyboard overlay looks at two resolutions and enlarged. Both lines are one pixel. You can imagine how wide the lines will be if you used two pixels and 200 dpi which is the default resolution for many scanners. Figure one is an example.

Once your overlay is finished save it as a black and white *.gif file.

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Use this file as the starting point for any HP 30b overlays you may need. The first one to make is to replace the missing notation and this version is shown full size (100%) in figure nine. The next overlay is for the programming commands when you write macros. See figure 10 for this overlay.

Once you have "drawn" your overlay you need to print and cut it. A steel ruler and an X-ACTO knife works well for cutting out the boxed framed keys areas. Paper is easier to cut than plastic or clear tape



Fig 7 – Finished 600 pixel/inch overlay – thin lines.

Fig 8 -Finished 300 pixel/inch overlay – 2x thicker lines.

covered paper. Cut on the outside of the framed boxes so no undesired printing remains on the overlay. Cutting is a delicate process; extra care and a very sharp blade are required to avoid breaking the thin spaces between keys.

Attaching the overlay to the HP30b keyboard may be done using a sliver of half inch wide clear tape as shown in figure 9.

A tweezers is an essential tool for doing this. This small piece of tape is hardly noticed and one in each corner top and bottom does a nice job. It is easily removed and reattached several times using the tweezers.

The overlay making process described here is useful for any calculator. All you need is a scanner, a photo editing program, patience, creativity, and a sharp X-acto blade.



Fig. 9 – A sliver of $\frac{1}{2}$ " wide tape secures overlay.

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Comments, ideas, and suggestions welcome.

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Notes

⁽¹⁾ You may adjust the size of the framed box, to a limited degree, by adjusting the tolerance of the color select tool. Experiment with various settings to see how the darker keys are selected. One consideration is the narrow spacing of the keys and the material you will use for the key board overlay. See the text.

⁽²⁾ If you want a little extra space around each key you may also add borders using white as the background color to make the rectangle the size you want. You may then change the background color to black and add the border to make the "framed box."