## Problem:
Is it possible to create a custom splash screen for a VersaLogic CPU board?

## Solution:
Yes, the embedded systems BIOS used on many of VersaLogic's CPU boards features a VGA resolution (640 x 480) graphics splash screen that can be enabled to appear when the computer starts. This feature is typically used to present a company logo or hide the initial BIOS information screens displayed when the computer boots. The splash screen can be enabled or disabled using CMOS Setup, and the graphic image can be field upgraded because it is stored in flash memory.

The VersaLogic boards that offer splash screen support are: EBX-11 (Python), EBX-12 (Cobra), EPIC-2 (Gecko), EPM-5 (Puma), EPM-32 (Cheetah), EPM-CPU-7 (Panther), EPM-CPU-10 (Jaguar), VL-686-2, VSBC-6, and VSBC-8.

The flash memory contains a default splash screen (BITMAP.BMP, shown below), but this can be easily overwritten by a user-designed 640 x 480 graphic created with a paint program such as Adobe PhotoShop.



## Procedure:
Below is an outline of the procedure for implementing a custom splash screen. Each step is discussed in detail in further in this article.

| Step | Notes |
|---|---|
| 1. Download the required utilities. | Two utilities are needed. CVTBMP.EXE converts the graphic file you create to the appropriate format. FBU.EXE enables you to program the splash screen into flash memory. |
| 2. Create the bitmap graphic. | The custom splash screen will be a 640 x 480 x 16 graphic in BMP format. You can use PhotoShop or other program to create it. |
| 3. Convert the graphic. | Use the CVTBMP.EXE utility to convert the BMP file to the Run Length Encoded (RLE) format. The converted file must begin with the letter B, have eight or fewer characters, and have an extension of .BIN. The file size must not exceed 64KB. |

| | |
|---|---|
| 4. Program the splash screen into flash memory. | Use the FBU.EXE utility's "Program Graphic Splash Screen" to do this. |
| 5. Enable the splash screen. | Use CMOS Setup to enable the display of the splash screen. |

## 1. Download the Required Utilities:

You can download the utility files to a hard disk directory of your choice. This procedure assumes that you have downloaded the utilities and copied your graphics files to the C:\TEMP directory. Substitute the actual directory name wherever C:\TEMP is used in this procedure.

1. Download the CVTBMP.ZIP file and extract the CVTBMP.EXE utility.
2. Download the FBU.EXE utility from the BIOS information page for your VersaLogic CPU board.

**Note:** It is important to use the right version of FBU for your system. Start at the private support page for your VersaLogic board and navigate to the BIOS update utility download link.

## 2. Create the Bitmap Graphic:

Bitmaps and icons are best created in a graphics design tool, such as PhotoShop. It is possible to create .BMP files using Windows Paint, but it is difficult to do because Paint has no palette management tools. Thus, it is difficult to define 16 colors that match-up to the capabilities of the hardware in 640 x 480 x 16 mode.

Some general rules of thumb should be followed in order to keep the size of graphical images within reasonable bounds so they do not exceed the 64K flash space available on the CPU. These are not hard-and-fast rules, but simply recommendations. For example, if you absolutely must use your standard corporate graphics already pre-approved by your marketing or legal department, it can be accommodated by the system, provided it stays within the 16 color budget and the colors used are supported by the hardware in the mode used by the graphical POST system.

1. Avoid large numbers of colors. Using more than four colors will start to bloat the file size. If more than 16 colors are used, it will not be displayed properly.
2. When storing the length of each consecutive string of colors, the RLE compression bit packs the line length. Fewer bits are used to represent details on the right side of the screen. If you must include large amounts of text, try to place the text as close to the right edge of the screen as you can. You can also make images smaller by making them less wide.
3. Do not use image enhancements such as dithering, horizontal gradient shading, anti-aliasing, or other techniques that would increase the number of breaks (changes in color) in a given horizontal line. Vertical gradients do not increase the file size as much as horizontal ones do. The most common embedded designs make use of 16-color modes. This is because all EGA/VGA devices support them through standard interfaces that have existed for some time. Out of all the non-VESA VGA modes, 16-color modes are the highest resolution and have been supported for the longest time. In the future, VESA support may be added, in which case 256-color mode may be supported at higher resolutions. While there is no guarantee that a VGA card will support VESA, all VGA

cards must support 640 x 480, 16-color mode, or they are no longer VGA compatible. Although VGA cards must also support the 320 x 200, 256-color mode, it is less desirable due to its lack of resolution. Most EGA/VGA, 16-color modes use a palette of 16 colors selected from a total of 64 different hues. The 64 colors are selected using two bits each for red, green, and blue. This means that you will have four shades of red, green, and blue, scaling up in 33 percent increments from no intensity (off) to full intensity. All the combinations of these are then available for use in the palette.

Note that some colors may be significantly altered when translated to the hardware palette. This is particularly true of colors that use 50% red, green, or blue, since the rounding error is extreme for these cases in 16 color modes. Unfortunately, since Windows provides eight bits for red, green, and blue for every entry in a palette, you must keep in mind that your palette may be changed significantly when it is actually used. If you do not keep this in mind when designing your palette, you may notice some strange discrepancies between the colors you intended to have displayed, and the colors that are actually displayed at run time.

**PhotoShop Procedure:**

With the above as a technical background, here is a simple procedure for creating splash screen images using PhotoShop.

**Note:** The exact steps of the procedure may vary depending which version of PhotoShop you are using.

1. Starting with a 640 x 480 blank image, create the graphic you wish to use as a splash screen. Place your logos and text, select your colors, and keep it simple. Once you finish creating the original splash screen, save it. Be sure to keep the original under a different name from your working copy, because you may want to refer back to the original image in later steps.
2. On your working copy, select Image > Mode > Indexed Color. If PhotoShop asks if you want to flatten the layers, click OK. In the Indexed Color dialog box, under Palette, select Custom. A palette selector dialog box appears. Create the custom palette you wish to use, making sure to keep R, G, and B values to 0, 85, 170 or 255. When your palette is complete, click OK.
3. Photoshop returns to the indexed color dialog box. Under Colors, select the number of colors you will be using plus one. Under forced, select none. Under Dither select None. Finally, click OK. Photoshop will automatically assign colors for your graphic from the custom palette created, using the closest color match available.
4. Save your final image as a Windows .BMP file using the Save a Copy command. Select four bits per pixel (if you used less than 16 colors). Do not select RLE compression. Your image must be an uncompressed .BMP file without RLE encoding. The CVTBMP utility will convert your file to its own, internal RLE format, which does not match the format of a Windows RLE-encoded .BMP file.

### *3. Convert the Graphic:*

Use the CVTBMP utility to convert the bitmap file to an RLE file.

1. Copy your .BMP file to the same directory as the CVTBMP utility; for example, C:\TEMP.
2. In DOS or full-screen DOS box, enter the following command:

```
C:\TEMP>CVTBMP graphicfile.BMP Bconvertedfile.BIN
```

where *graphicfile* is the name of the splash screen .BMP file and `Bconvertedfile` is the name of the binary file to be created. The converted file must begin with the letter B, have eight characters or fewer, and must have an extension of .BIN. If you use a filename longer than eight characters, DOS will truncate it. Here is a command line example:

```
C:\TEMP>CVTBMP MYSPLASH.BMP BITMAP.BIN
```

The utility will display a representation of how the splash screen will look during actual use. If the screen looks as you intended, proceed to the next step. If not, you can edit the graphic and perform the conversion again. (To exit the splash screen display, press the spacebar.)

**Note:** The output file is a non-standard RLE formatted file which PhotoShop is unable to produce directly. The file size must not exceed 64KB for most BIOS versions.

### 4. Program the Splash Screen into Flash Memory:

Use the Flash BIOS Update utility (FBU.EXE) to program the splash screen data into flash memory on the VersaLogic board.

1. Copy the RLE file created in the previous procedure into the same directory as FBU; for example, C:\TEMP.
2. From DOS, run FBU, as shown below.

```
C:\TEMP\>FBU
```

3. Select the Program Graphic Splash Screen option and follow the on-screen instructions.

**Note:** The FBU utility can be executed from a floppy drive, but it runs faster from a hard drive.

### 5. Enable the Splash Screen:

The splash screen is enabled with a CMOS setup option. The location and name of the option depends on which VersaLogic CPU board you own.

1. Enter CMOS Setup by pressing Delete during the early boot cycle.
2. Enable the splash screen using the appropriate setting for your VersaLogic board, as shown below.

| VersaLogic CPU Board | CMOS Setup Splash Screen Setting |
| --- | --- |
| EPM-CPU-7, VL-686-2, VSBC-6 | `Basic CMOS Configuration | Splash Screen = Enabled` |

| EBX-12, EPM-32, EPM-CPU-10, VSBC-8 | Custom Configuration \| Splash Screen = Enabled |
|---|---|
| EPIC-2 | Features Configuration \| Graphical/Audio POST = Enabled |
| EBX-11, EPM-5 | Features Configuration \| Splash Screen = Enabled |

3. Reboot the system.

## Extending the Length of Time the Splash Screen Appears

When the splash screen is enabled, it appears on the computer display for approximately one second when the computer boots. This can be lengthened by disabling the configuration box (a system information display screen shown at boot time) in CMOS Setup. The splash screen will remain visible until a graphics reset command is issued by the operating system or by your application program. To disable the configuration box, enter CMOS Setup and set the Config Box parameter as shown below.

```
Basic CMOS Configuration | Config Box = Disabled
```

If the Configuration Box is enabled, the splash screen will automatically switch back to text mode. The BIOS switches the video mode to 25 x 80 color using an INT 10 call with AX = 0x0003 (mode 3). A form feed character is then printed, causing the splash screen to clear. The following code will also switch the video chip to mode 3:

```
MOV AX, 0003

INT 10
```

If the Configuration Box is disabled, the splash screen will remain showing for much longer. It then becomes the responsibility of the operating system or your application program to put the video controller into 25 x 80 color (mode 3), which will clear the screen.

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