Creating CHR (Character) files for MPU 3/4 Emulator

Now that the development tools are freely available, it makes sense to try to explain how to prepare CHR (character) files for use with the MPU3/MPU4 Emulator.

Before starting, it's important to explain that this process is very much based upon "trial and error", and due to the variable configuration of differing machines, it's impossible to describe precisely how this is done. Instead, use this as a guide to get you started in the right direction, and apply some common sense to finish off...

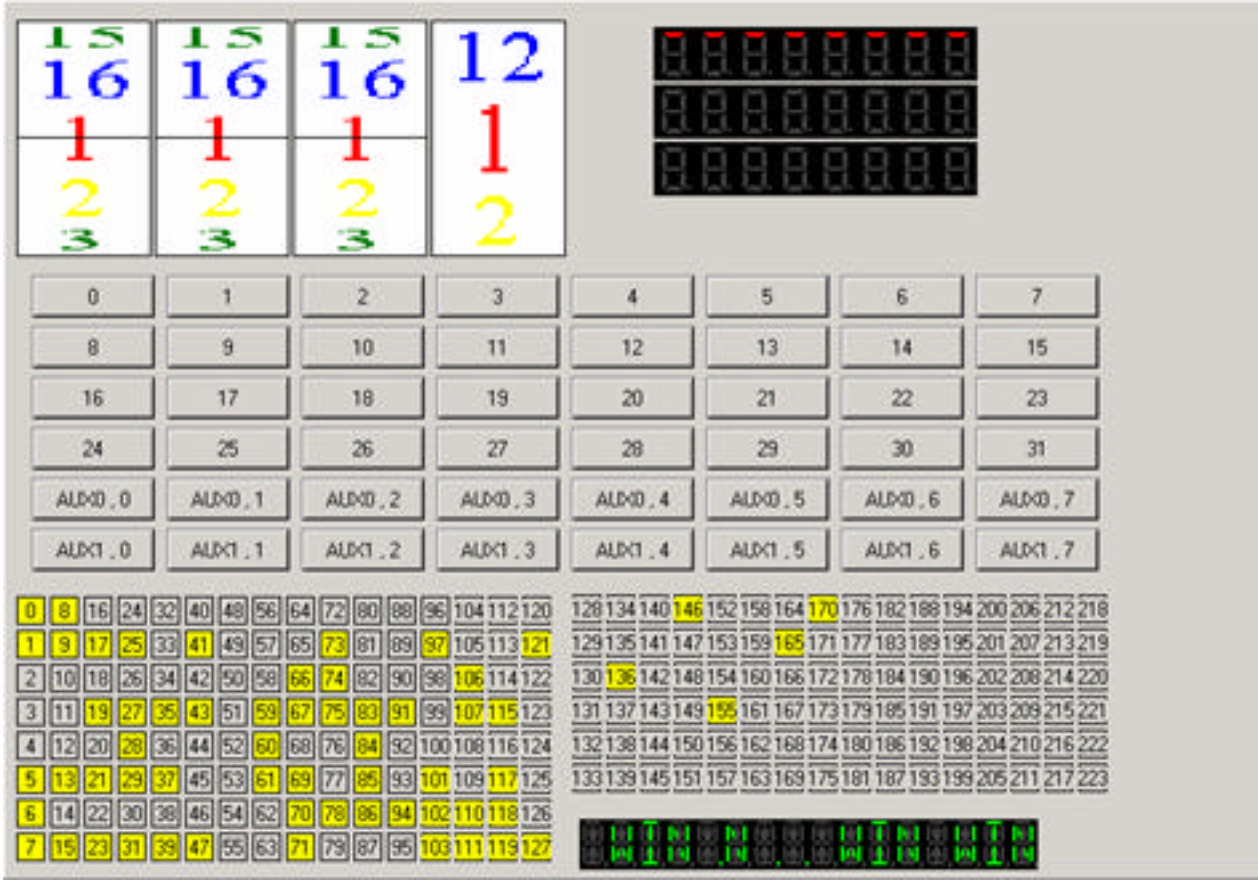
The tutorial also assumes a familiarity with layout design, and does not attempt to teach that here, although some basic concepts are reiterated.

Preparation

First of all, you'll need the ROMS for the machine in question. This tutorial makes use of the Andy Capp II : The Great Escape ROMS, however the principle is similar for most others.

Start the emulator, and load in the *blank.res* layout file. Then, load the required ROM, in this case *a5ts.p1* and finally set some basic options as desired in the configuration screen. For example, it'll be most likely easier to use a 0 delay, and will help some if the DIP switches are correctly set where possible. If the machine shows a "Reel Setup Alm", then most likely the number of reels is incorrectly set. In the case of Andy 2, this requires reel setup *5b* to work. Don't worry about the extender setting for now (unless known) as the process of creating the CHR will only use the first bank of lamps, 0-127

You should now have something resembling the following:



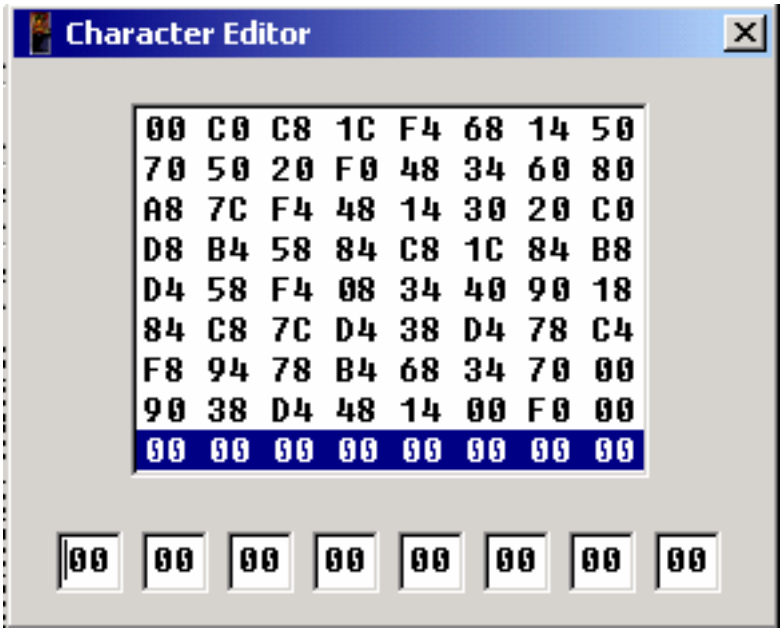
What is the effect of the CHR file?

Well, basically the CHR process involves determining 8 numbers. Each of these 8 numbers affects the lamps in one particular row of lamps, 0-120, 1-121, 2-122 etc in order so the 6th number will affect 5-125 for example. Having incorrect values will cause the lamps to be “jumbled up”. That is to say that they will appear in the wrong locations, sometimes resulting in two lamps having the same number !

Starting the Process

Well, the first 3 lines (4 in a 4-reel eg. Club game) can give you some clues as to where to start normally. Oh? How so? Simply because normally the reel lamps are contained in the top-left 3x3 (or 3x5 for club) square, so we have a fair idea of where they should be. If we can set the first 3 numbers (or 5) such that the reel lamps function, this should give a good start on finishing the others.

Go to the Design menu, and choose “Edit Character” and a window will appear like this one:



As you will notice, the first thing to do is click on the bottom row in the top panel (currently all zeroes). Underneath the top panel, you can see 8 edit boxes. This is where we will perform our trial-and-error on the 8 different numbers. The leftmost number refers to the top row, then the next row and so on down to the bottom row, represented by the rightmost number.

Now, the first number is very often zero – this will be apparent from the attract mode in the game. In the case of Andy Capp II it is, so let's move on to the second number.

Sit and watch the attract mode for a few moments. You should be able to tell fairly quickly that the second reel lamps (1, 9 and 17) are not flashing correctly. In fact, if you look closely, you'll see that they've apparently moved to 97, 113 and 121. So we'll double-click the second number in the Character Editor. The number changes to a 04 (always increases by 04 in Hex, so the sequence is 00-04-08-0C-10-14-18-1C etc up to 7C when the next click will loop back around to 00). Now we need to press the "Reset" button. This is not always necessary, but the change is not always immediate – It will only take place the next time the software reads the CHR value. Because this is somewhat unpredictable, resetting the machine forces this to take place immediately. ***Tip: RESET is often Button number 23 which will avoid the need to reset using the configuration screen – just press Button 23 momentarily!***

So what happened? Didn't appear to do much, so let's double click again. Ah! Now the reel lamps appear to have moved again, this time to 105, 113 and 121. ***Tip: When determining the reel lamps, a reset is not always necessary. Often this can be done by inserting credit (usually Aux1,7) and pressing START to spin the reels (often Button 31). Each time start is pressed, the CHR is often re-read, so we can double-click the value, press Button 31 to check the results, and***

repeat until correct. It should be apparent whether the CHR is re-read. If the lamps don't appear to move after 3 or 4 clicks, a RESET is necessary to update the CHR, so this method will not work.

This process is now repeated until the reel lamps on that row move to the correct location. This should happen for Andy II when the second number is set to 70. However, it seems that some lamps are still not *quite* correct, so double-clicking once more to 74 finishes that row.

Our edit boxes now look like this:

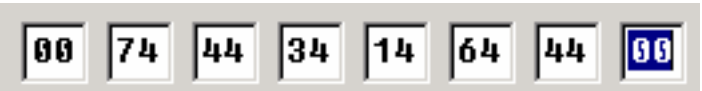
Great! We're making progress. The same technique as above can be applied to determine the 3rd number, as this also has an impact on the reel lamps. In the case of Andy II, this will give 44. Once these first 3 numbers are set (in this case 00, 74, 44), you'll notice that the reel lamps are now functioning correctly.

That's great, but what now?

OK, so far so good. Now you'll probably want to play the game a little to see what the lamps might be for. The astute will notice that there's a likely chance that lamps 120 thru 126 are in fact the trail lamps leading to feature entry. They'll also notice a pattern emerging in the block from 64 to 119 – This is the actual feature trail, and there's a pattern there during attract mode. Again, just double-click the number corresponding to the row, press *RESET* and see the results. This is a tedious process, but eventually, the pattern should become more defined, and the rest of the numbers will be easier to work out.

In the case of Andy Capp II, the last number is also 00, so there's another freebie thrown in for us here! This isn't always the case though, unfortunately.

So now we should have the final sequence:



Can I double-check my results?

Well yes you can! Go into the test mode, and choose the lamp test (often test 3) and watch the lamps being flashed on and off in sequence. If the sequence looks a little unusual in places, or the same lamp flashes twice, then it's back to the drawing board I'm afraid. Of course, you'll be able to see on which line the mistake occurs, and adjust only the relevant number.

Finally, of course, there's no substitute to actually playing the game. Play the game, and check that the sequence appears correct. This should be fairly apparent.

Conclusion

OK, so this document is fairly short, and doesn't explain much about designing layouts. It never set out to do that! Hopefully though, you can now have a stab at generating CHR files for ROM sets for the emulator. (Unless you've less than a dozen brain cells of course!) It isn't easy, so don't let failure put you off, just try again. Just for fun, why not try doing the CHR for a layout you already know the workings of – Take your favourite game, see how the lamps light, and try to work out a CHR from scratch for it – you'll soon get the hang of it!