Insert Manually a Song Available on the Forum

In this tutorial we'll be importing in FF3us a song that is already in FF6 music format. There is no need for musical knowledge to be able to complete the following steps. The only things that will help is being familiar with the hexadecimal system as well as some basic ROM hacking knowledge like what is an offset, the difference between an absolute and HiROM offset and how to use an hex editor.

1. Getting the file and tool

We'll be using the FFIV song "The Prologue" from our Song Database. The other thing you will need is a hex editor. There are many you can choose from but I'd suggest one that has a copy selection, paste-write and paste-insert functionalities. One good all purpose hex editor is HxD and this is what has been used to take the screenshots below.

2. Files we will be importing

Extract the files from **FF4_prologue.7z** and you will see the following files:

Name	Date modified	Type	Size
prologue.spc	2015-01-31 12:01 ...	Chipamp SNES Ch...	65 KB
prologue_DATA.bin	2015-01-30 12:39 ...	BIN File	2 KB
prologue_INST.bin	2015-01-29 7:34 PM	BIN File	1 KB

prologue.spc is the song in SNES format. Those can be played with a SPC player or with winamp and a plug-in. For more info on SPC file and how to play them, use Google or check the great extracted music tutorial at FantasyAnime.com. The DATA ans INST files are two binary files, the first has the music data in FF6 format and the other the instruments used in the song. The DATA and INST files do not contain instrument samples, those are in the game.

All songs in our song database have the three same files. Some songs, mostly done by tsushiy and having a "ᴾ" next to their title need the instrument patch, available in the same thread. This patch install new BRR samples in the game, giving access to a wider range of instruments to use in songs. Some songs instrument file use those added instruments.This is not the case of our prologue song.

3. Choosing the right spot

The first thing that you have to ask yourself is *"do I want to replace an existing song or expand the number of existing songs?"* If you only want to replace a existing song you can skip to section 4. To expand the number of songs there are few thing to do. First you have to move the $C53E96-$C53F94 song pointers block because there is no room to add an extra one. To find a spot in non-expanded ROM, you can look here. The offsets in this list take in account the ROM header though while my whole tutorial assume you have a headerless ROM, so substract 0x200 from the offset you choose. You can also expand your ROM and put the pointers in the $FX banks.

I decided for the example to take the $EEAF01 spot, which has 767 free bytes, which is more than enough. As shown in the image below, I select with the mouse the pointer block, I do *Ctrl+C*, *Ctrl+G* to enter my destination (you can scroll a long time for the same result) and then *Right-Click→Paste write.* Now let's say I would put my song at $F30540 in expanded ROM, I would type **40 05 F3** at $EEB0000 (see right picture). You would use song ID $56 for your new song in game events as an example. As you have guessed pointers are always inverted whether they are two or three bytes long. As for the old pointer data copied, you can blank with 00 or FF all the data since you moved it, giving you room for other things if needed.

The next thing to do is to change the following code. It's the only place pointers are read and you have to modify each LDA instruction so new base offset, new base offset + 1, new base offset + 2. This is not an ASM course so I'm not explaining further except only mentioning you have a total of 9 bytes to change.

Original code

```
C5/0538:  BF963EC5      LDA $C53E96,X  (SPC pointer low byte)
C5/053C:  8510          STA $10
C5/053E:  BF973EC5      LDA $C53E97,X  (SPC pointer middle byte)
C5/0542:  8511          STA $11
C5/0544:  BF983EC5      LDA $C53E98,X  (SPC pointer high byte)
C5/0548:  8512          STA $12
```

Modified code

```
C5/0538:  BF01AFEE      LDA $EEAF01,X  (SPC pointer low byte)
C5/053C:  8510          STA $10
C5/053E:  BF02AFEE      LDA $EEAF02,X  (SPC pointer middle byte)
C5/0542:  8511          STA $11
C5/0544:  BF03AFEE      LDA $EEAF03,X  (SPC pointer high byte)
C5/0548:  8512          STA $12
```

Last thing to do is changing the total number of songs. The offset is $C53C5E. It's a single byte that should be $55. Increase it of one each time you add a new song (replacing an existing one does not count). So congratulation you have not expanded pointer and can add as much songs as you want up to a limit of 255!

4. Verifying the song length

The next thing to do is verifying if your song fit in the spot you have chosen. If you expanded the song pointers and put your song in expanded ROM, you'll likely won't have to consider the following but some info is still important. Open the DATA file with HxD. The first two bytes (inverted) are the amount of bytes the song take. In our case it is 0x044C bytes, as seen below.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
00000000   4C 04 26 00 4C 04 26 00 E6 00 63 01 02 02 8B 02
```

You have to verify the song will not "hit" the next song or the data after. If you locate your song in regular non-expanded ROM but outside the songs block, refer to the ROM map to verify. All you have to do is add to your song offset the song length and verify it is lower than next data. If you only replace a song by *The Prelude*, check the song list. Song are in order that they appear in the ROM. You need to consider the song following yours. I decided we are replacing *"Another World of Beast"*.

| $21 | $C8EFA6 | Another World of Beasts |
| $22 | $C8F472 | Grand Finale #2 |

$C8F472 - $C8EFA6 = 0x04CC

We are below the limit with our 0x044C bytes for *The Prelude* so we are ready to insert the song!

5. Copying the song data

Copy all the content of **prelude_DATA.bin** (*Ctrl+C*) go to your ROM do *Ctrl+G* and enter "08EFA6". You'll land on the offset you need to paste the song data (*Right-click→Paste-write*). The below two screenshots are the beginning and ed of the song pasted.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0008EF60   53 53 C4 32 4C B3 C4 1E 53 53 C4 32 4E 4E 4E 4C
0008EF70   B3 C4 1E 53 53 C4 32 47 E3 E2 01 C4 0A C5 60 46
0008EF80   E2 1F 53 E3 C5 60 0A E2 1F 53 E3 C4 32 4C B3 C4
0008EF90   1E 53 53 C4 32 4C B3 C4 1E 53 53 C4 32 47 E3 B6
0008EFA0   B6 B6 B6 F6 18 EF 4C 04 26 00 4C 04 26 00 E6 00
0008EFB0   63 01 02 02 8B 02 48 03 B9 03 E8 03 26 00 E6 00
0008EFC0   63 01 02 02 8B 02 48 03 B9 03 E8 03 F2 32 D4 D9
0008EFD0   01 F0 78 C4 3C C6 1E DC 20 D6 05 47 AC 4F B3 4F
0008EFE0   4F B3 4A 4A 4A 4A 71 AC 79 B3 79 79 B3 74 74 74
0008EFF0   74 D7 01 AC 09 B3 09 09 B3 04 04 04 04 01 AC 09
```

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0008F3B0   A9 51 4F 51 51 4F 51 4A B6 A8 A8 A8 A8 A8 A8 A9
0008F3C0   51 4F 51 51 4F 51 74 B7 4A 74 B7 51 4F 51 51 4F
0008F3D0   51 74 BA 4A BA 74 B7 51 4F 51 51 4F 51 74 B7 4A
0008F3E0   74 B7 4A 74 BA 74 BA 82 B7 51 4F 51 51 4F 51 F6
0008F3F0   02 04 B9 B7 B9 B7 B9 B7 B9 B7 B9 B7 B9 B7 B9 B7
0008F400   B9 B7 B9 B7 B9 B7 B9 B7 B9 B7 B9 B7 B9 D6 05 2B
0008F410   AB A9 AB A9 AB A9 AB 2B AB A9 AB A9 AB A9 AB F6
0008F420   E5 F3 C4 50 DC 24 C6 40 D4 C9 30 12 EF DD 0A E0
0008F430   08 B7 B9 B7 B9 D6 04 2B AB A9 AB 2B AB A9 AB 2B
0008F440   AB A9 AB 39 AB A9 AB 2B AB A9 AB 2B AB A9 AB 2B
```

You can optionally put *00* or *FF* at the place of the rest of the old song. This way you can easily see where there is unused space.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0008F3E0   74 B7 4A 74 BA 74 BA 82 B7 51 4F 51 51 4F 51 F6
0008F3F0   02 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F400   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F410   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F420   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F430   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F440   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F450   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F460   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F470   00 00 A1 05 98 F4 15 FA 98 F4 A9 F5 8B F6 71 F7
```

6. Changing the song pointer

If you have to put your song elsewhere in the ROM, you need to modify the pointer and you can

calculate its position will the below formula. It's simply pointers base offset + (song ID multiplied by 3). The other method is doing a hex search in HxD with the old offset of the song. In the case of as an example $C8EFA6, search for *A6EFC8*.

$$\$C53E96 + (0x21 * 0x03) = \$C53EF9$$

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
00053EE0   C8 C1 CE C8 30 D3 C8 56 DA C8 BF DD C8 6B E1 C8
00053EF0   57 E3 C8 E2 E3 C8 48 EA C8 A6 EF C8 72 F4 C8 15
00053F00   FA C8 43 FE C8 4B 05 C9 E9 05 C9 66 0A C9 B6 90
```

7. Changing the instruments

Now the other part of the job is changing the song channels instruments. It's the same logic to calculate the beginning of a song instruments, except you multiply your song ID by 32 (0x20). The instruments file is 32 bytes in size (16 channels times 2 bytes per instruments). First byte is instrument ID, second byte is always 00.

$$\$C53F95 + (0x21 * 0x20) = \$C543B5$$

Once the instruments data is pasted, save your ROM. Note that you can save (*Ctrl+S*) anytime during the tutorial, it does not matter.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
000543A0   00 07 00 14 00 0F 00 00 00 00 00 00 00 00 00 00
000543B0   00 00 00 00 00 0D 00 0E 00 0C 00 12 00 16 00 07
000543C0   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000543D0   00 00 00 00 00 08 00 0E 00 0D 00 2C 00 12 00 14
000543E0   00 16 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000543F0   00 00 00 00 00 0D 00 08 00 0B 00 1B 00 1E 00 02
00054400   00 17 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00054410   00 00 00 00 00 0D 00 0E 00 1E 00 02 00 0F 00 11
00054420   00 12 00 22 00 14 00 00 00 00 00 00 00 00 00 00
```

You'll notice *The Prelude* has 6 instruments. As mentioned previously some songs downloaded from the forum (not a majority) might have incorrect instruments. In such an event, you'll need to assign the correct instruments. There is a complete list of original instruments here. You'll need to identify each channel instrument and replace what you think are the wrong ones. A bit trial and error but you'll develop your music skills. If you have instruments IDs in your file from $40 and above it mean your song require the instrument patch available in the same thread as the songs. The songs requiring will have a "ᴾ" next to their name. The wrong assigned instruments are often those, because the author added more instruments in his hack without noticing the admins, resulting in instrument indexes above the limit of the patch.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
000543A0   00 07 00 14 00 0F 00 00 00 00 00 00 00 00 00 00
000543B0   00 00 00 00 00 0D 00 0E 00 0C 00 12 00 16 00 07
000543C0   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000543D0   00 00 00 00 00 08 00 0E 00 0D 00 2C 00 12 00 14
000543E0   00 16 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000543F0   00 00 00 00 00 0D 00 08 00 0B 00 1B 00 1E 00 02
00054400   00 17 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

8. Details on song channels

A thing that differs between songs available on the forum and original songs are the channel pointers in the song. Below is a channel of *The Prelude* and the song at the end loop toward the beginning of the blue section. The last command is F6 02 04 which mean continue by going back to 0x0402 byte after the start of the song. Every song in the original game have these command relative to their offset in the ROM meaning this F6 command would look like as F6 8E F3 ($C8F38E). It would not be exactly this because a song don't redo the first channel commands twice but I talk about this because such a tutorial would not have been possible with an unmodified original song, because when you move it you need to change all the song loop commands and channel pointers at beginning of song data. By having the custom song channel pointers start at 00 00 and not the song offset last two bytes, we easy the process a lot.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0008F380   A8 A8 A8 7E B6 7E B6 7E 7E 7E B6 F6 CD 03 D4 D9
0008F390   01 C4 50 C6 40 DC 24 B6 A8 A8 A8 A8 A8 A8 A9 AC
0008F3A0   D6 03 51 4F 51 51 4F 51 4A B6 A8 A8 A8 A8 A8 A8
0008F3B0   A9 51 4F 51 51 4F 51 4A B6 A8 A8 A8 A8 A8 A8 A9
0008F3C0   51 4F 51 51 4F 51 74 B7 4A 74 B7 51 4F 51 51 4F
0008F3D0   51 74 BA 4A BA 74 B7 51 4F 51 51 4F 51 74 B7 4A
0008F3E0   74 B7 4A 74 BA 74 BA 82 B7 51 4F 51 51 4F 51 F6
0008F3F0   02 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0008F400   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Below, a loop command of an original song pointing at $C8F9B9. In the case of a custom song, we would see more or less F6 0X YZ, likely something below 0x0A00.

```
Offset(h)  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
0008F9E0   9E D7 3C D8 9E 4A B7 4A 58 B9 58 5B E2 07 74 D7
0008F9F0   2E D8 E3 E3 BA 9E BA 9E BA 9E BA 9E 7E 9A D7 0E
0008FA00   D8 7E BA 9E BA 9E BA 9E BA 9E D7 00 D8 8C 62 D7
0008FA10   00 D8 F6 B9 F9 2C 04 3B FA 43 FE 3B FA BC FA 35
0008FA20   FB CD FB 62 FC C3 FC 28 FD 99 FD 3B FA BC FA 35
0008FA30   FB CD FB 62 FC C3 FC 28 FD 99 FD F0 49 F4 F8 F7
```

9. Conclusion

This tutorial was aimed at beginners. The rest of music hacking is harder and require some practice.

However it is in the range of anyone having the time and patience to learn. As a conclusion I've made a small video showing the import and at the same time did a little tribute to those who contributed to the song database.

Result in-game

sd-result.mp4

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