Manually Insert a Song Available on the Forum

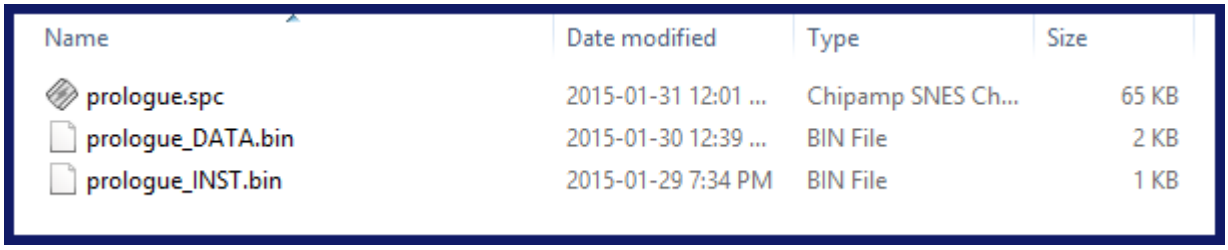
In this tutorial, we'll be using FF3us to import a song that is already in the FF6 music format. You do not need musical knowledge to complete the following steps. The only thing that will help is being familiar with the hexadecimal system, offsets, the difference between an absolute and HiROM offset, and hex editors.

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 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:



prologue.spc is the song in SNES format. These files can be played with an SPC player or by using winamp and a plug-in. For more info on SPC files and how to play them, use Google or check out the great extracted music tutorial at FantasyAnime.com. The DATA and INST files are both binary files; the former contains the music data in FF6 format, and the latter contains the instruments used in the song. The DATA and INST files do not contain instrument samples, as those are in the game already.

We provide the same three files for every song in our song database. Some songs (most were made by tsushiy and have a "ᵖ" next to their title) require the instrument patch, which is available in the same thread. This patch installs new BRR samples in the game, giving access to a wider range of instruments to use in songs. Some song instrument (INST) files use those added instruments. This is not the case with our prologue song, so we do not need to apply the patch in this tutorial.

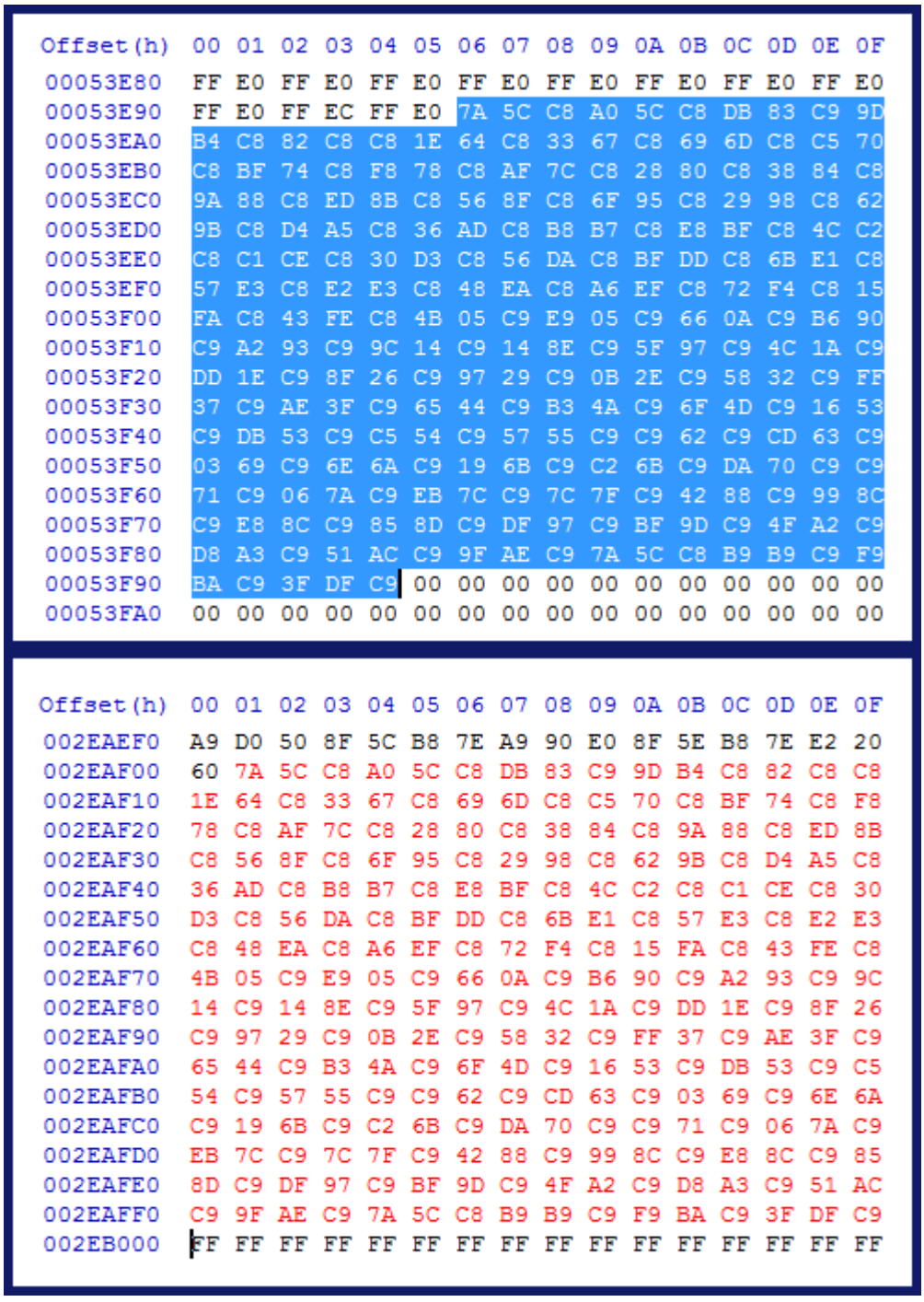
3. Choosing the right spot

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. You must follow several steps to expand the number of songs. First, you have to move the song pointers block at $C53E96-$C53F94 because there is no room to add an extra one. To find free space in a non-expanded ROM, you can look here. The offsets in this list take the ROM header into account, but my whole tutorial assumes that you have a headerless ROM, so you must subtract 0x200 from the offset you choose. You can also expand your ROM and put the pointers in the $FX banks.

For this example, I chose the spot at $EEAF01, which contains 767 free bytes. This is more than enough to contain the song pointers. As shown in the image below, I:

1. Select the pointer block with the mouse
2. *Ctrl+C*
3. *Ctrl+G* to jump directly to $EEAF01 (it would take a long time to reach it by scrolling)
4. *Right-Click → Paste write.*

Let's say that I want to put my song at $F30540, which is in expanded ROM. I would type **40 05 F3** at $EEB0000 (see right picture above). In this example, you would use song ID $56 to play your new song from event code. As you may have guessed, pointers are always inverted regardless of whether they are two or three bytes long. As for the old pointer data that you copied, you can overwrite it with 00 or FF since you moved it, giving you room for other things if needed.



Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00053E80	FF	E0	FF	E0	FF	E0	FF	E0	FF	E0	FF	E0	FF	E0	FF	E0
00053E90	FF	E0	FF	EC	FF	E0	7A	5C	C8	A0	5C	C8	DB	83	C9	9D
00053EA0	B4	C8	82	C8	C8	1E	64	C8	33	67	C8	69	6D	C8	C5	70
00053EB0	C8	BF	74	C8	F8	78	C8	AF	7C	C8	28	80	C8	38	84	C8
00053EC0	9A	88	C8	ED	8B	C8	56	8F	C8	6F	95	C8	29	98	C8	62
00053ED0	9B	C8	D4	A5	C8	36	AD	C8	B8	B7	C8	E8	BF	C8	4C	C2
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
00053F10	C9	A2	93	C9	9C	14	C9	14	8E	C9	5F	97	C9	4C	1A	C9
00053F20	DD	1E	C9	8F	26	C9	97	29	C9	0B	2E	C9	58	32	C9	FF
00053F30	37	C9	AE	3F	C9	65	44	C9	B3	4A	C9	6F	4D	C9	16	53
00053F40	C9	DB	53	C9	C5	54	C9	57	55	C9	C9	62	C9	CD	63	C9
00053F50	03	69	C9	6E	6A	C9	19	6B	C9	C2	6B	C9	DA	70	C9	C9
00053F60	71	C9	06	7A	C9	EB	7C	C9	7C	7F	C9	42	88	C9	99	8C
00053F70	C9	E8	8C	C9	85	8D	C9	DF	97	C9	BF	9D	C9	4F	A2	C9
00053F80	D8	A3	C9	51	AC	C9	9F	AE	C9	7A	5C	C8	B9	B9	C9	F9
00053F90	BA	C9	3F	DF	C9	00	00	00	00	00	00	00	00	00	00	00
00053FA0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
002EAEF0	A9	D0	50	8F	5C	B8	7E	A9	90	E0	8F	5E	B8	7E	E2	20
002EAF00	60	7A	5C	C8	A0	5C	C8	DB	83	C9	9D	B4	C8	82	C8	C8
002EAF10	1E	64	C8	33	67	C8	69	6D	C8	C5	70	C8	BF	74	C8	F8
002EAF20	78	C8	AF	7C	C8	28	80	C8	38	84	C8	9A	88	C8	ED	8B
002EAF30	C8	56	8F	C8	6F	95	C8	29	98	C8	62	9B	C8	D4	A5	C8
002EAF40	36	AD	C8	B8	B7	C8	E8	BF	C8	4C	C2	C8	C1	CE	C8	30
002EAF50	D3	C8	56	DA	C8	BF	DD	C8	6B	E1	C8	57	E3	C8	E2	E3
002EAF60	C8	48	EA	C8	A6	EF	C8	72	F4	C8	15	FA	C8	43	FE	C8
002EAF70	4B	05	C9	E9	05	C9	66	0A	C9	B6	90	C9	A2	93	C9	9C
002EAF80	14	C9	14	8E	C9	5F	97	C9	4C	1A	C9	DD	1E	C9	8F	26
002EAF90	C9	97	29	C9	0B	2E	C9	58	32	C9	FF	37	C9	AE	3F	C9
002EAFA0	65	44	C9	B3	4A	C9	6F	4D	C9	16	53	C9	DB	53	C9	C5
002EAFB0	54	C9	57	55	C9	C9	62	C9	CD	63	C9	03	69	C9	6E	6A
002EAFC0	C9	19	6B	C9	C2	6B	C9	DA	70	C9	C9	71	C9	06	7A	C9
002EAFD0	EB	7C	C9	7C	7F	C9	42	88	C9	99	8C	C9	E8	8C	C9	85
002EAFE0	8D	C9	DF	97	C9	BF	9D	C9	4F	A2	C9	D8	A3	C9	51	AC
002EAFF0	C9	9F	AE	C9	7A	5C	C8	B9	B9	C9	F9	BA	C9	3F	DF	C9
002EB000	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

The next thing to do is to change the following code, which is the only place where these pointers are read from. You have to modify the three LDA instructions to the new base offset, the new base offset + 1, and the new base offset + 2. This is not an ASM course, so I will not explain this further except for mentioning that 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
```

The last thing to do is to change the total number of songs. The offset where this value is stored is $C53C5E. It's a single byte that should be $55. Increase it by one each time you add a new song (replacing an existing one does not count). Congratulations! You have now expanded the pointers, so you can add up to 255 songs!

4. Verifying the song length

The next thing to do is to verify if your song fits in the spot that you have chosen. If you expanded the song pointers and put your song in expanded ROM, you 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) show the amount of space (in bytes) that the song takes up. In our case, the song is 0x044C bytes long, 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” and overwrite the next song or the data after. If you want to locate your song in regular non-expanded ROM that is outside the song block, refer to the ROM map to verify this. All you have to do is add the song length to your song offset and verify that it is lower than the offset of the following data. If you are only replacing a song with *The Prelude*, check the song list. The songs are in the same order that they appear in the ROM. You need to consider the starting offset of the song following yours. I decided that we will replace *“Another World of Beasts”*.

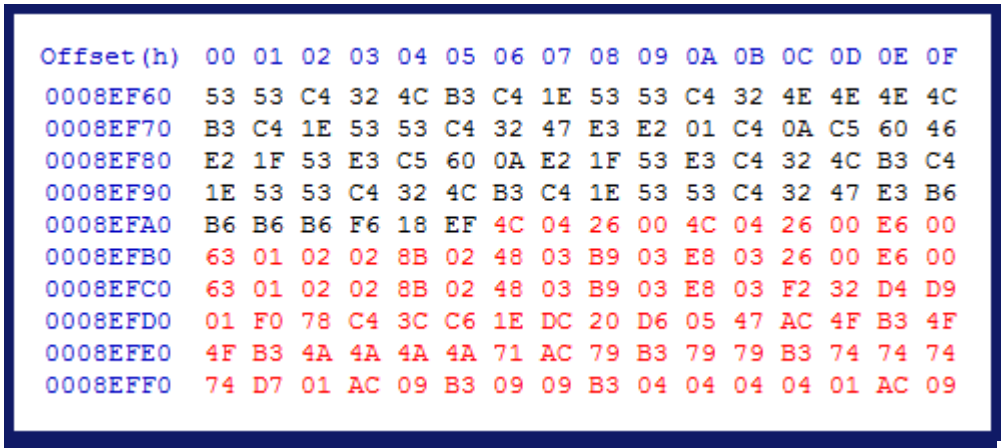
$21	$C8EFA6	Another World of Beasts
$22	$C8F472	Grand Finale #2

$C8F472 - $C8EFA6 = 0x04CC

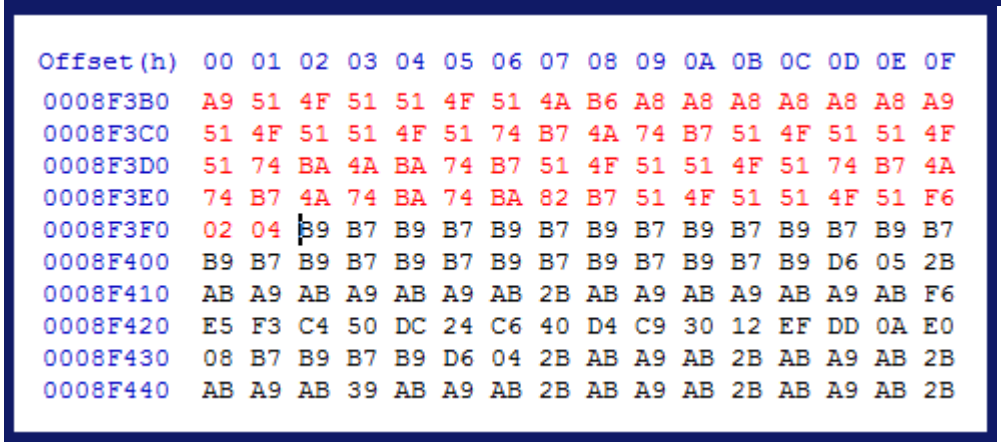
We are below the limit with our 0x044C bytes for *The Prelude*, so we are ready to insert the song!

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.

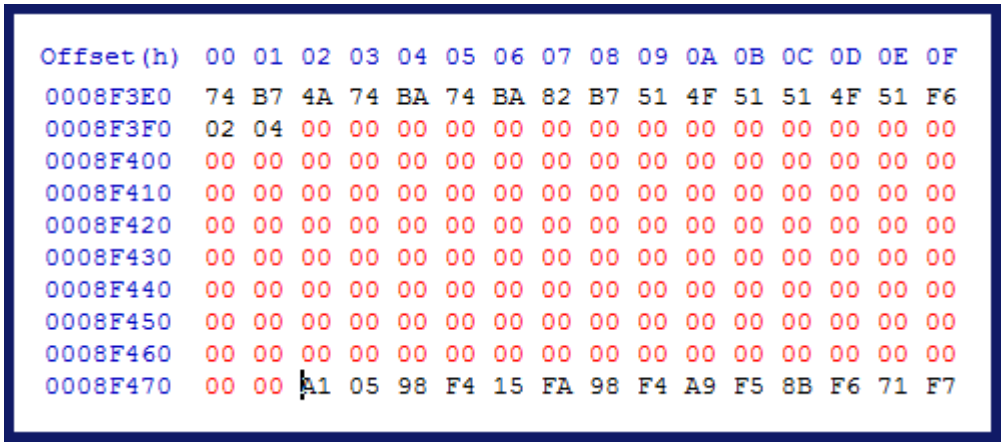


Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0008EF60	53	53	C4	32	4C	B3	C4	1E	53	53	C4	32	4E	4E	4E	4C
0008EF70	B3	C4	1E	53	53	C4	32	47	E3	E2	01	C4	0A	C5	60	46
0008EF80	E2	1F	53	E3	C5	60	0A	E2	1F	53	E3	C4	32	4C	B3	C4
0008EF90	1E	53	53	C4	32	4C	B3	C4	1E	53	53	C4	32	47	E3	B6
0008EFA0	B6	B6	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

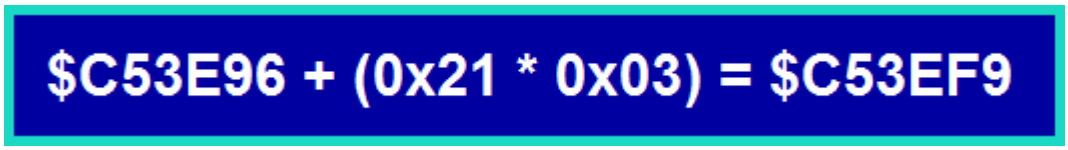
You can optionally put *00* or *FF* at the place of the rest of the old song. This way you can easily see where there is unused space.

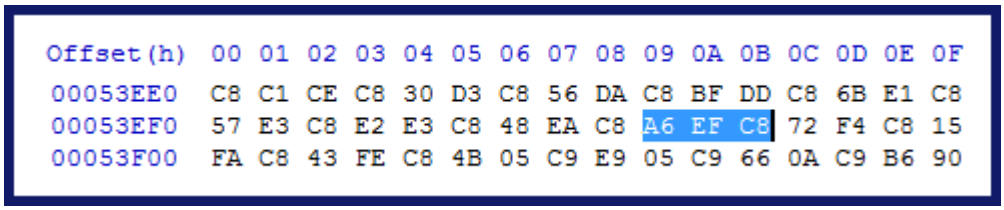


Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
0008F3E0	74	B7	4A	74	BA	74	BA	82	B7	51	4F	51	51	4F	51	F6
0008F3F0	02	04	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0008F400	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0008F410	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0008F420	00	00	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*.

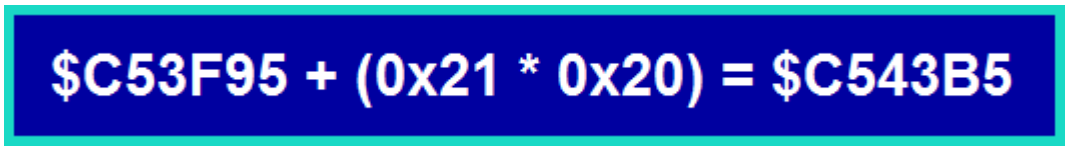




Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00053EE0	C8	C1	CE	C8	30	D3	C8	56	DA	C8	BF	DD	C8	6B	E1	C8
00053EF0	57	E3	C8	E2	E3	C8	48	EA	C8	A6	EF	C8	72	F4	C8	15
00053F00	FA	C8	43	FE	C8	4B	05	C9	E9	05	C9	66	0A	C9	B6	90

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.



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

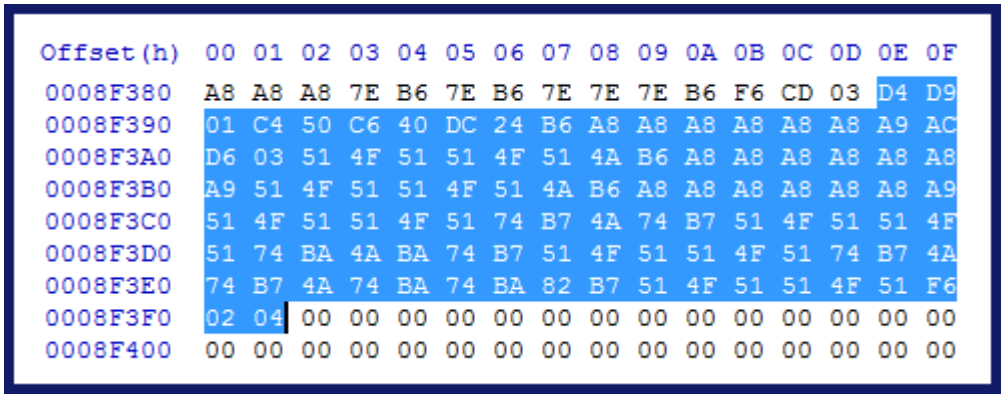
Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
000543A0	00	07	00	14	00	0F	00	00	00	00	00	00	00	00	00	00
000543B0	00	00	00	00	00	0D	00	0E	00	0C	00	12	00	16	00	07
000543C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
000543D0	00	00	00	00	00	08	00	0E	00	0D	00	2C	00	12	00	14
000543E0	00	16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

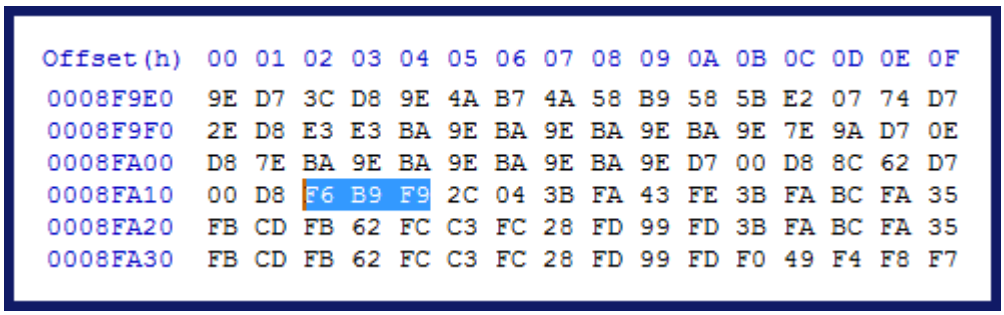
8. Details on song channels

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 XX, likely a number 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.

10. Result in-game

sd-result.mp4