USER'S NOTES FOR "HARMONY"

1. DESCRIPTION

HARMONY is a program designed to exploit the full musical potential of the Fuller Box.

It takes a lot of hard concentrated work to reduce a piece of music to coded form. So if you want simply to get the computer to play three-part harmony, sounding like a "mechanical" device, it is probably not worth the trouble of using a complex system like HARMONY. But if you want to make the computer play a really sensitive interpretation - your interpretation - with all the nuances, the "touch", the rubato, etc., you can make it all happen. It is not in fact as difficult as it seems at first, and given a bit of practice you will soon find yourself writing down code, or even inputting it direct, at a surprising speed. It can be very rewarding and positively addictive. The combination of the 48K Spectrum and the Fuller Box can be a really expressive instrument.

2. THE PROGRAM TAPE

SIDE 1

The first program is simply a demonstration of some of the musical capabilities of the Fuller Box: the music is Mozart's "Rondo alla Turca" (LOAD "MOZART"). It runs automatically, and the menu which appears after the music has played is self-explanatory. Note that this particular program is in fact an earlier version of HARMONY, and has fundamental differences in structure from the version used on the rest of the tape. The final musical effect is, however, identical.

The second program on Side 1 is a transcription of Scott Joplin's "The Entertainer" (LOAD "JOPLIN"). This is the standard version of the HARMONY program, and you will notice that it has a more extensive menu. More about this later.

SIDE 2

The first program is a fragment of Chopin's "Minute Waltz" (LOAD "CHOPIN"). The same remarks apply as for "JOPLIN" on Side 1.

The second program is called "COMPOSE" (LOAD "COMPOSE"): this is because it is simply a skeleton program meant for you to insert your own coded music. It only has one line of data (line 3001), which plays the note A: this could be useful if you wanted to fine-tune your Fuller Box to any other instrument.

3. THE MENU

YOU CAN ALWAYS SILENCE THE BOX, RETURN TO THE MENU, AND GET YOURSELF OUT OF TROUBLE SHOULD YOU GET LOST BY ENTERING "GO TO 9999". (N.B. "GOTO g" OR "GOTO G" WILL DO THE SAME AND IS EASIER TO TYPE.)

3.1 PLAY is self-explanatory. If you want to abort in the middle of the music, use BREAK followed by GO TO 9999.

3.2 CONTINUOUS will play the music over and over until you use BREAK and GOTO 9999.

3.3 TEMPO CHANGE will display the current Tempo and ask for a new value. The lower the value, the faster the music. Limits are 1 to 255.

3.4 ASSEMBLE is used to transmute music that you have coded (see below) into bytes that the machine code program can understand. The assembly process is a fairly complicated one, and in average music it proceeds at about 12-15 bars per minute. Except when you have entered new music, and during its debugging stage, you are not likely to use the ASSEMBLE facility unless you have somehow corrupted the code (perhaps by demanding more of the ENVELOPE CHANGE facility than it can deliver!), and want to get back to the original: it is usually quicker in such cases, however, simply to reload your original assembled music from tape rather than to wait for the assembly process to do its work from scratch.

3.4.1 ERROR MESSAGES DURING ASSEMBLY These will appear for one of two reasons. Obviously, the Spectrum cannot check if you have written in a wrong note, but it can add up: it checks to see that each section of your data contains an exact multiple of 5 characters, and that in each bar the three channels contain the same total number of length units. These two are the most disastrous potential mistakes, and when they occur a message on the screen tells you which data line to check and correct, and also tells you that you can then restart assembling from that point with the simple command **GOTO 1080.**

3.5 QUIT Self-explanatory. GO TO 9999 will return you to the menu whenever you want.

3.6 SAVE makes it very easy to save your music on tape. Simply hit S, start the tape recorder, and hit any key: the program will now be saved. Then you will be cued to hit a further key, leaving the tape recorder running: the machine code program, some variables, and the assembled music will now be saved. On loading, the code will load automatically after the program which is saved in autostart mode. (Some Spectrums seem reluctant to VERIFY programs saved with the **SAVE "xxx" LINE n** option. If you find this a problem, it may avoid frustration if you make a habit of saving everything twice!)

3.7 NEW NOTE TABLE makes it possible to fine-tune the three channels. There is a sub-menu giving a choice of STANDARD, FINE TUNE, and DIFFERENTIAL. Fine Tune simply shifts all three channels the same amount, according to the increment (positive or negative) that you enter: you will have to experiment with values, but +3000 and -1500 will shift the music up or down approximately a whole octave. Such extreme values, however, will erode the accuracy of the pitch. Differential tune gives you the opportunity to enter individual increments for the three channels. Values such as 0, 10 and 20 respectively can give pleasant rich harmonies. Larger values will produce the most ghastly discords.

3.8 ENVELOPE CHANGE asks you for new values of envelope shape and length. See the Fuller leaflet for the envelope shape codes. You will then be asked if you want to define or redefine which areas of the music are to be envelope-controlled. You are given the opportunity to define up to 5 sections (giving the start and finish bar number of each section) for each of the three channels. Having defined a section, try experimenting with envelope shape and length values. You will get some unexpected and interesting results. Note that if you enter the define/redefine routine, the computer's first action is to wipe out your previous definitions of envelope-controlled areas and bring back the music as originally coded,

without any added envelope-controlled areas. You are in fact starting on a clean sheet. The prompts should be self-explanatory.

4. CODING YOUR OWN MUSIC

HARMONY controls all three tone channels of the Fuller Box in time, pitch, and volume: there are therefore three corresponding components in the data code.

4.1 VOLUME CONTROL There are 16 possible volume levels on each channel. These are given the symbols a to p (from silent to fortissimo). q will hand over control to the envelope shaper: the qs may be written into the original data, or inserted later direct into the assembled code under the control of the E option on the Menu.

4.2 LENGTH CONTROL Decide on a length value to assign to, say, a quaver. For the sake of convenience (except in the case of very fast or very slow music) 12 is a good figure to use: it is divisible by 2, 3, and 4, which makes semiquavers, triplets, etc., easy to code. A note may have any length value between 01 and 99. Note that the length value is only a relative value, as the absolute length can be adjusted with the Tempo control. Should you want to hold on a note for longer than 99, or should a note be held on into the next bar, repeats of the same note without a pause will produce any length you like.

4.3 PITCH CONTROL You do not have to look up the values (coarse and fine) to send to the chip for every note. Instead, the notes are simply numbered from 1 to 72 (from bottom C to top B), and the program will interpret these numbers into the appropriate values. (See table at the end of these notes).

4.4 THE CODE STRUCTURE This is very simple. Take the first bar, and code the first channel. For example, if you have assigned a length of 12 to a quaver, and want the volume of this channel to be set at p, and you have a bar consisting of QUAVER C:QUAVER PAUSE:QUAVER D (staccato):QUAVER E the code will be something like **p1237a1200p0439a0800p1241**. Notice that it is all in groups of 5 characters (1 for volume, 2 for length, 2 for pitch). Notice also how the pause is produced: **a1200** The final 00 is of course irrelevant, as the pitch does not matter when the volume is zero, but it is essential to have two digits there to make up the group of five. The staccato is produced with **p0439a0800**. In other words, you hold on your note for four length units, and then put in a pause for the balance of the quaver-length. Now do the same for the other two channels.

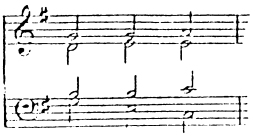
4.5 INSERTING THE CODED MUSIC INTO THE PROGRAM Examine the way this has been done in the JOPLIN or CHOPIN programs. You will see that Bar 1 is in line 3001, bar 2 in 3002, etc. The three separate channels are independently enclosed in quotes, and separated from each other by commas. DATA is of course the essential way to begin each line. Note that the three channels MUST contain an identical total of length units (in the example below this is 48).

```
3001 DATA "a1645108441084510849108 47","a4800","a4800"
```

Lines 4000 and 4001 should be left intact as they are essential terminators for the PLAY and ASSEMBLE modes.

4.6 ASSEMBLING Simply use the A option on the menu. In case there is a disastrous mistake which might cause a crash (though this is unlikely), it is a good idea to save the program before attempting to play the music

4.7 EXAMPLE Here is the first bar of God Save the Queen:



This is how the code looks:

```
3001 DATA "m2344a0200m2344m2446","l2439l2441l2437","j2336a0200j2336j2437"
```

Notice the a0200 groups. These insert a very short pause between notes that are repeated rather than held on. Also notice that Channel 1 is louder than Channel 2, which is in turn louder than Channel 3. Above all, add up the length units in each channel, and check that the totals are the same (in this case 72).

(In this case, for the sake of clarity, the top 3 voices have been assigned respectively to Channels 1,2 and 3. In fact, it may have been musically better to omit the upper (tenor) voice in the bass clef, and use the bottom (bass) voice instead. This is a choice you have to make as you go along, perhaps dodging from voice to voice to give the best harmonies within the limitations of three channels.)

TABLE OF NOTES

	Octave 1	Octave 2	Octave 3	Octave 4	Octave 5	Octave 6
C	01	13	25	37	49	61
C sharp	02	14	26	38	50	62
D	03	15	27	39	51	63
D sharp	04	16	28	40	52	64
E	05	17	29	41	53	65
F	06	18	30	42	54	66
F sharp	07	19	31	43	55	67
G	08	20	32	44	56	68
G sharp	09	21	33	45	57	69
A	10	22	34	46	58	70
A sharp	11	23	35	47	59	71
B	12	24	36	48	60	72