MUSIX81

composer

+

drummer

USER'S MANUAL

ZX81 VERSION 1.Ø1

MUZIX 81

COMPOSER

+

DRUMMER

USER'S MANUAL
ZX81 VERSION 1.01

Written by Andrew and Alex Szalay

INDEX

1. INTRODUCTION

This unique combination of inexpensive hardware and programs allow you to use your own analogue synthesizer to compose, edit and replay music (no special keyboards or synthesizers are required).

Full screen editing will show several lines of your musical score simultaneously, where you can modify it interactively with the use of a cursor. Record lines of music by using the keyboard of your synthesizer, then after editing transpose them and form a verse or a refrain in any combination. From the verses (altogether 24 different verses possible) the whole song can be assembled then replayed. During this process you can always listen to any line or verse, the ZX81 will play it for you. When a song is ready, it can be stored on a cassette in digital form for later use.

When you want to record your own song on a multitrack, first lay a sync-track, using the sync output of the MUZIX81 box, then by connecting the sync-track output to the MUZIX81 sync input the computer will synchronize to the tape. To avoid machine-like precision (case you don't like it) the computer can even introduce a tiny random delay in order to simulate a human player.

Another version of this program lets you design your own rhytms and the computer controls an external drum-box. A 48K Spectrum version will soon be available as well.

MUZIX81 offers a unique and inexpensive solution to your needs in editing and recording complex musical scores, should that be in a large professional recording studio, in a live concert or in your home. Compose and store your songs at home, then load and replay them instantly while in the studio ! This system was used on several recordings under EMI and WEA label already, saving considerable studio costs.

For further information contact:

Andrew A. Szalay
P.R.Computer
Poroszlai ut 6/a
H-4032 DEBRECEN, Hungary

2. SETUP AND GO !

2.1 General Instructions

In order to use the MUZIX81 composer you do not have to be a computer programmer. You do not even have to use the BASIC book of the ZX81 except the initial setup. Follow the instruction steps for the setup procedure, and you will have no problems at all. In order to be able to use the MUZIX81 system you need the following:

i/ MUZIX81 Composer box
ii/ MUZIX81 Composer program (on a cassette)
iii/ Sinclair ZX81 microcomputer with 16K memory module
iv/ any commercial TV set
v/ any commercial cassette recorder (preferably with tape counter)

Warning: do not use Dolby, ferrochrom or chromdioxide cassettes when recording to and from the ZX81 !!

2.2 Setup Instructions

1..... Plug the connector of the MUZIX81 box between the ZX81 and the memory. Be very careful when doing this, especially by unplugging the devices. We recommend the use of a SINCLAIR 16K RAM. Other memories of 16K or larger (64K) may work as well, but results cannot be guaranteed. The further products in the MUZIX81 line (ECHO/HARMONIZER/EMULATOR) will be using 64K of memory. If you consider buying these products, contact your dealer.

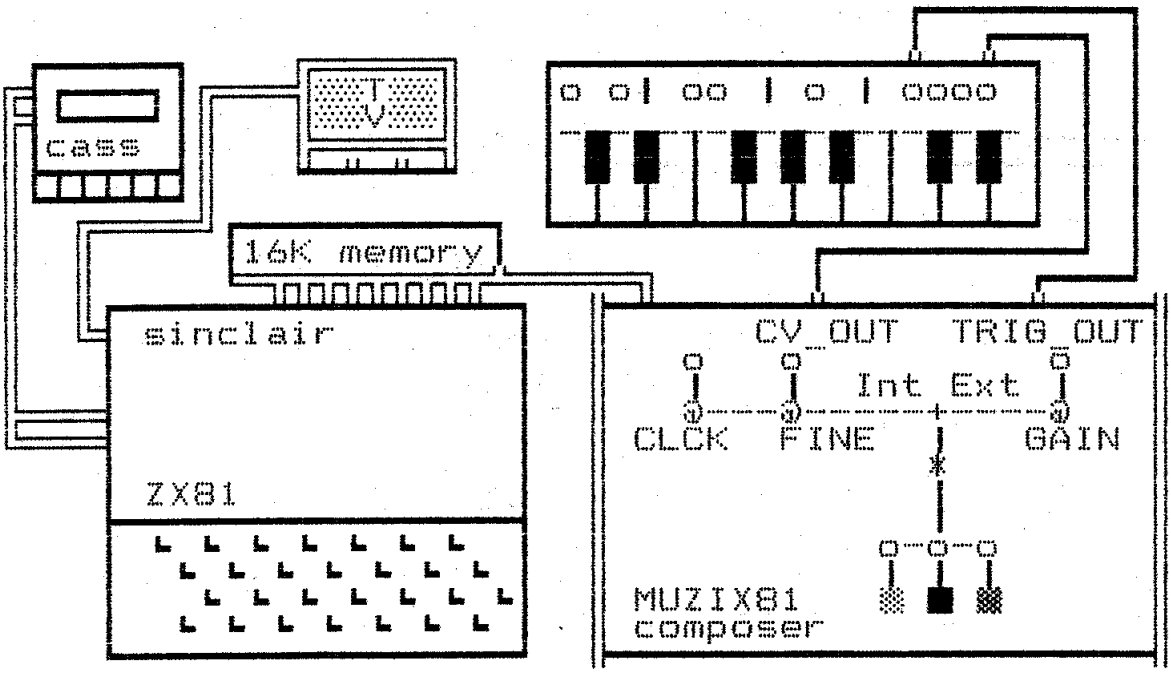
2..... Move the slide switch on the box to be in the [INT] (left) position. Your synthesizer should have a 1V/octave control voltage input. Connect it to the CV_OUT socket of the MUZIX81 box. Your synthesizer also has a gate or trigger input. Now connect it to :
-- TRIG OUT 1 if you have a MOOG or KORG (switch trigger)
-- TRIG OUT 2 if you have a ROLAND or ARP (voltage trigger).
If you do not know, what kind of trigger pulse your synthesizer accepts, you can try either.

3..... Set up your computer with the TV as it is described in the ZX81 book Chapter 1. Connect your cassette recorder to it (ZX81, Chapter 16, first half page). The inverse K cursor should appear as normally. Read carefully how to load a program (Chapter 16 "Loading a Program with a Name"), and then type

LOAD "MUZIX81" or just LOAD"".
In order to achieve LOAD"" you have to push the key J (LOAD is the keyword above it), and twice the SHIFT P. This latter means that you first press the SHIFT key, hold it down and then press P twice. In case of an error delete it with RUBOUT (SHIFT Ø).

4..... Now press NEWLINE, and start the cassette playing from the beginning. Do not be surprised on the length of the program, it should take about 6 minutes. If the MUZIX81 logo does not appear then see Note 1. Otherwise stop the tape, go on and press any key. On the notation assignment question type + (SHIFT K), and now you see the main MENU.

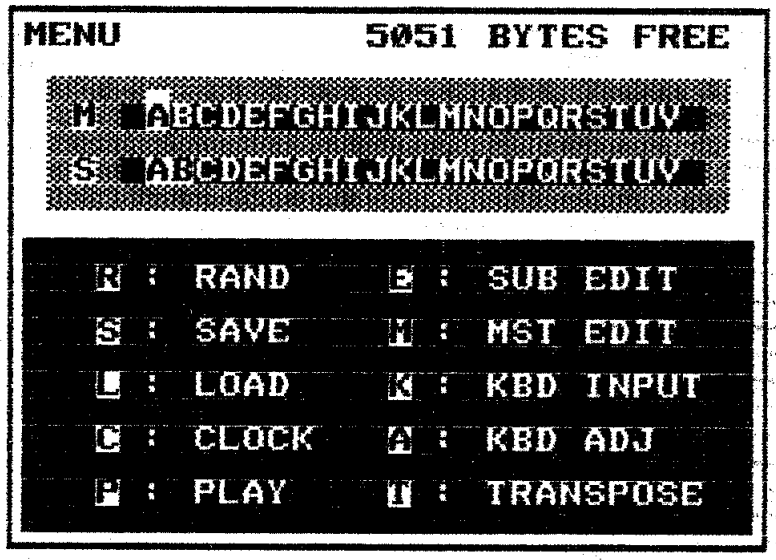
5..... The cassette contains a demonstration music file recorded soon after the program. Start the tape and press L to load it. When loading has finished, push P to play the music written into the program. Also push the start button on the MUZIX81 box. You can hear a tune from Grieg's Peer Gynt Suite, if you did not forget to connect the synthesizer to an amp. The speed can be varied with the [CLOCK] and [FINE] pots. Pressing any key (except BREAK in the right lower corner) returns you to the main menu.



Note 1 Try to check all reasons noted in Chapter 16 of the Sinclair manual. If "CHECKSUM INCORRECT" appears, then the program is loaded, but it still contains an error. You can try to run it (press R, then NEWLINE), but unexpected results might happen. We recommend to reload it.

2.3 MENU Screen

The first thing that you will see after the notation assignment is the MENU Screen. This contains all the options you have at your disposal upon a keystroke for manipulating the musical data.



On the top of the picture you see the DIRECTORY. This shows, by using inverse colors, which of the available SUB and MASTER sequences (see Chapt.2. and Chapt.3.) do contain melodies already. You will find this feature extremely useful later on. Just above the DIRECTORY you see the words XXXX BYTES FREE. This shows the amount of free memory in the system.

The next part of the display lists several keys and associated commands. Pressing any of the keys on the MENU will cause the execution of the command next to them. Pressing any other key (except BREAK, which will terminate the program, so do not press it) will have no effect at all. The individual commands on the MENU screen are discussed in the next chapters of this manual with tutorial excercises (in italics).

Do not confuse the letter O, and the number Ø ! The latter one is indicated on the ZX81 screen by a slash (/) across.

3. SUB EDIT

Each SUB is a sequence of maximum 64 individual notes. These notes can have a range of more than 5 octaves (actually 64 semitones).

At the beginning, before anything else, the program will ask whether you want to use sharp or flat notation. You can answer this by typing either

+	(SHIFT K)	for sharp
−	(SHIFT J)	for flat

From this point on the notes can be typed either in sharp or flat form (see below), they will always be converted to the one given by this assignment.

3.1 Pitch and Octave of Notes

The notes are denoted with octave range plus the "standard" musical notation:

0C - means the lowest C note
2C+ - means C sharp in the 2nd octave
3A− - means A flat in the 3rd octave.

3.2 Lengths of Notes

The first digit of a full note contains the length of the note, preceding the octave range and separated from it by a period (.) :

6.2G+ - is a G sharp in the second octave with length 6.

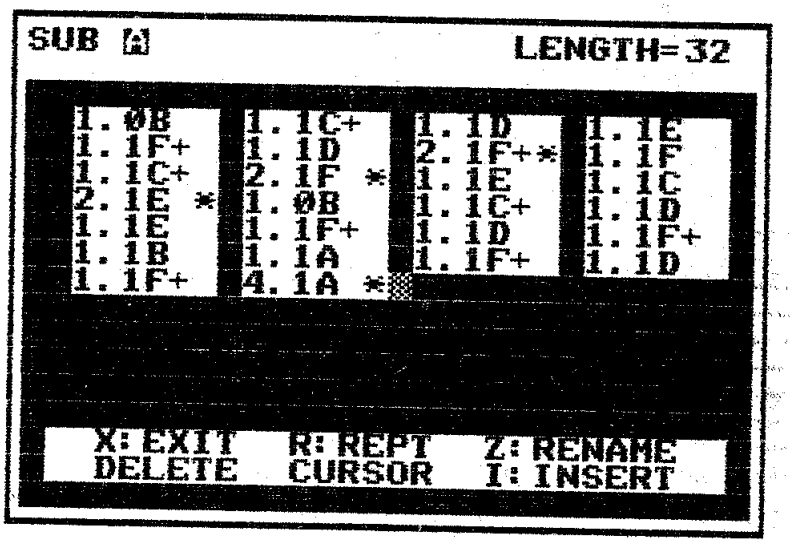
This length can be between 1 and 8. If longer notes are needed, it can be done easily as we will see later.

Exercise

To start a simple editing session, press first the key E on the ZX81, to request the menu option SUB EDIT. Then on the bottom line on the screen you will see the words:

<SUB EDIT> WHICH SUB ?

Now you should select one of the sequences denoted by the letters A-V, say A. So by pressing the key A you have selected SUB A. You will see the contents of SUB A displayed on the screen in the above notation.



At the upper left hand corner it is always shown, which SUB are you editing. At the upper right hand corner the actual length of the sequence is displayed. It is useful to have a look at it from time to time, just to check that you have entered melodies correctly.

Have a closer look at the melody now. With a little experience you will be able to follow this notation very easily. In order to return to the main MENU, press the key X (for EXIT). Press X now, and after getting back to the MENU, look at some other SUBs as well.

3.3 Emphasis: Trigger and Accent

The MUZIX81 gives a short trigger pulse at the beginning of each new note. This starts the ADSR envelope generators of your synthesizer. It acts as if you were playing on the synthesizer in a staccato mode, so the actual length of a sustained note is determined by the decay or release settings of the envelope generator only (there is no "gate" signal). There is an other output, the accent, which is ØV normally and +5V in active state. It has the same length as the corresponding note. This can be used as a gate signal if required (or for opening filters, switching on modulation, giving some notes an extra emphasis), which helps to create a more 'live' sound.

As you probably noticed by now, there were extra signs after some of the notes in the example. They are controlling the trigger and the accent of the synthesizer. All the possible combinations depend on the last character attached after the note. They can be the following:

Trigger	Accent	Sign
Yes	No	
Yes	Yes	*
No	No	==
No	Yes	/

In other words a simple note, as it stands, will have a proper trigger generated but no accent. Some examples:

6.3F-	normal trigger, no accent
4.2D+*	normal trigger, with accent
8.4A	normal trigger, no accent
5.1F-=	no trigger, no accent
3.2B-/	accent yes, but no trigger

3.4 Cursor Use

When you enter the SUB EDIT mode again, there is a grey character between the notes. It shows the position of the cursor, an indicator pointing to a note in the sequence, where we intend to make some changes. The cursor can be moved around very easily with the help of the keys left-, right-, up- and down-arrows (SHIFT 5 to SHIFT 8):

left-arrow	(SHIFT 5)	moves cursor one note back
right-arrow	(SHIFT 8)	moves cursor one note forward
up-arrow	(SHIFT 7)	moves cursor one line up (four notes back)
down-arrow	(SHIFT 6)	moves cursor one line down (four notes forward)

If one tries to move the cursor above the top, it will automatically go to the beginning. In the opposite case it will go to the end of the SUB.

Excercise

Enter SUB EDIT mode and edit SUB A. As the Edit Screen appears, press with your left hand the SHIFT key on the left side of the keyboard, and with your right hand press the appropriate keys 5-8. Each time you press a key, the screen will blink a little, and the cursor will appear at a different location. Now try to move the cursor to the beginning, then move it to the end. Then try to pick a certain note in the SUB and move the cursor just in front of it !

3.5 Substitute

In this section it will be described, how to change a note in the SUB. It consists of two steps. First, the note to be changed has to be identified by moving the cursor just in front of it. Having done this the old note will be substituted with the new one by typing the new note and then pressing NEWLINE. The cursor will be placed after it, so you can quickly proceed to substitute several notes in a row. If you move the cursor to the end of the SUB, you can go on typing, all the new notes will be appended to the end of the sequence. If you made an error when typing in the new note, the message

ILLEGAL NOTE, TYPE AGAIN

will appear. Do not panic, just type it again, but this time more carefully. If you entered a syntactically correct note, but you immediately realized it being wrong musically, you can easily delete it.

3.6 Delete

If you press the DELETE or RUBOUT (SHIFT 0) key, this will have the effect of deleting the note immediately preceding the cursor. After the usual blink the note disappears from the screen, and the rest is shifted back by one note to fill its place.

3.7 Insert

Move the cursor to the point, where the new note is to be inserted. Then first press the key I (for Insert) then go ahead with typing in the full new note. After pressing NEWLINE, as usual, the screen will blink. The notes to the right of the cursor will be shifted forward by one note in order to make place for the new one. The new note is then inserted into the empty place.

3.8 Shorthand Typing

The MUZIX81 Composer program always remembers the notes you have typed before, so if you enter notes of the same length, or notes in the same octave, you do not have to specify these all over again, just leave them out ! There is one rule, however: you always have to define the pitch and emphasis! If you first type 4.2C+ and your next note is 4.2F+, you can type either of the following (the program will understand and add the missing parts):

F+ 2F+ .2F+ 4.F+ 4.2F+

3.9 Pause (P)

Typing 6P or 8P results in a pause of length 6 or 8 clock periods, respectively. The pause is actually a note with octave and pitch identical to the previous one, but with the trigger and accent suppressed (emphasis is = , see 2.3), so no new envelope will start. This can be used to create lengths greater than 8 as well (continuation notes). Simply pressing P will recall the last length used. If the last note typed was 4.3A- , then

6P is 6.3A-=
P is 4.3A-=

If you would like to enter 12.2C (this is not a syntactically correct form !) then enter first 8.2C then 4P.

3.10 Repeat (R)

If you enter identical notes, one after the other, you may use the Repeat option. Pressing the key R is identical to repeating the last note typed in an Insert or Substitute. Typing 3.2G- then R is equal to 3.2G- then 3.2G- . In all the above cases pressing NEWLINE was necessary to enter the new notes. REPEAT is done at the touch of R, no NEWLINE is needed.

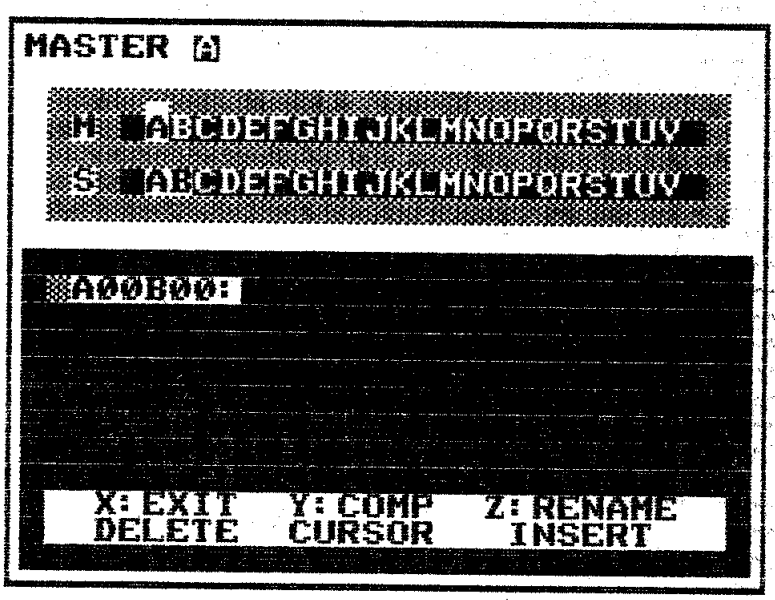
3.11 Rename (Z)

One can rename the SUB just being edited by pressing the key Z. The program asks for the new name of the SUB with

RENAME TO:

After pressing the appropriate key the name of the SUB is changed and the original SUB remains unaltered. Actual changes will take place only upon returning to the MENU with X (for advanced use of RENAME see 13.).

4. MASTER EDIT



4.1 Select and Chain SUBs

From the simple sequences, the SUBs, more complicated structures can be built which will be called MASTERs. If SUB D contains a sequence then the MASTER

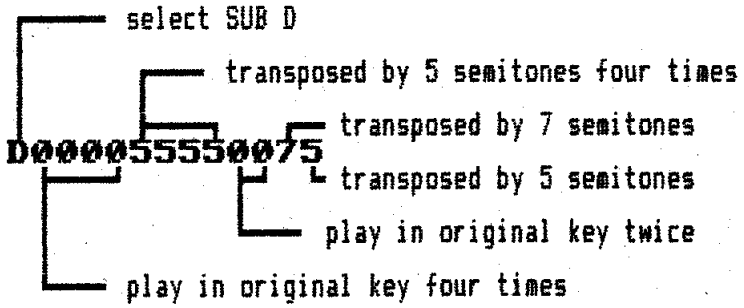
D0000

will play D four times: The alphabetic character in the beginning selects the SUB to be played and the numbers following cause the SUB to be played once each. Such elements can be chained one after the other, e.g.

A0220B00G55D572A00

4.2 Dynamic Transpose

In the above example some of the numbers are different from 0. They are used to transpose the sequence dynamically at PLAY time. This feature is illustrated on the next example where SUB D will be played altogether 12 times, 4 times in the original key then 4 times transposed by 5 semitones then twice in the original key again, then once transposed by 7 and and once by 5 semitones.



4.3 Calling Other MASTERs

One can define a MASTER containing a full verse of a song, say MASTER V. Then another master containing the refrain can be constructed in MASTER R.:

verse (MASTER V) **V> :** **B0000C0055D22A00**
refrain (MASTER R) **R> :** **G7755F00E00**

Instead of chaining all the SUBs in the song one can do a much more elegant job by calling the verse and refrain as a whole unit by the symbols

V> **R>**

consisting of the name of the MASTER followed by a > (SHIFT M) sign. A MASTER playing the verse twice then the refrain, then once the verse again would be

V>V>R>V>

They can be mixed with other substrings freely as the next example shows:

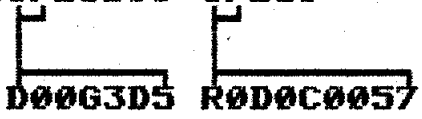
A0035V>V>B55V>R>A00V>V>R>

4.4 Repetition

One can repeat the last part or the whole of the song infinitely by inserting repetition signs denoted by a colon (:)

```
C>...  D00G3D5
S>...  R0D0C0057

                                  repeat infinitely
M>...  A0035C>B3D00:S>B50:
```



If there is only one repetition sign then the repeated part is from the beginning to the colon.

4.5 Cursor Use, Insert and Delete, Rename

The use of the cursor and RENAME is identical to the SUB EDIT mode. It is described in detail in sections 3.4-3.7. Editing is somewhat different. The new characters typed are always inserted at the cursor. To substitute a character, first delete it then enter the new one. In this mode the cursor deletes backwards.

4.6 Compile Before PLAY

Several MASTERs can be defined and used within a song. The more you use the simpler the structure will be. There has to be a main MASTER, though, which contains the full structure of the song. If there is one already defined then i the DIRECTORY it is denoted by a little white 'hat' above it. The way to tell the program which one is the main MASTER is to exit from its MASTER EDIT by pressing the key Y (otherwise just press X as usual). The MASTERs are stored in a highly compressed form in order to save memory, thus the main MASTER must be transformed, compiled into a form that the program can immediately PLAY (see 5.).

5. PLAY

After pressing P the program will play the prepared sequences as defined in the last compiled MASTER (see 4.6). The play is actually a two-phase operation. First, the ZX81 enters a wait mode: it is waiting for an external clock signal (either from the clock generator or from the multitrack) then after it has arrived, in the second phase, it will PLAY the next note. In order to play a sequence the clock from the MUZIX81 box (or the multitrack with the sync-track) is to be started by using the [START] (green) button. When clock signals are coming through the MUZIX81 box the little red LED just above the three pushbuttons should flicker (for the detailed use of the [START], [STOP] and [STEP] see 14.3).

In order to save memory the MASTERs are stored in a highly compressed form which must be activated, compiled before it can be played. If there is no main MASTER in the program (indicated with the little white 'hat' above it in the DIRECTORY) then the program cannot decide which one to play, so a warning message appears

<PLAY> - COMPILE FIRST

In this case enter the EDIT of the relevant MASTER and immediately exit from it by pressing Y in order to compile (see 4.6).

When the song is completed the program automatically returns to the MENU. It can be stopped earlier by pressing any key (but the BREAK!) on the ZX81 keyboard. It is advisable to use keys which have no meaning in the MENU (say V,B,N in the bottom row).

Warning: If the program refuses to play and you cannot imagine why, then check the cassette recorder; if it is running, stop it ! Signals coming from the cassette may interfere with the PLAY mode.

6. CLOCK

Pressing C starts a measurement of the incoming clock period. This is a useful feature in reproducing tempos set earlier. The clock rate appears on the screen in the usual metronome time units : number of clocks per minute.

After measuring one clock period the program returns to the MENU automatically, exception is when there is no clock pulse present. In this case one can return to the MENU by pressing any key on the ZX81 keyboard.

7. SAVE, LOAD

With the MUZIX81 program's own SAVE and LOAD commands your sequences can be recorded in a compressed digital form to a cassette and reloaded any time later on.

8.1 Saving Music Files

1. ..... Check if the cable is connected to the MIC sockets in both the cassette recorder and the ZX81.

2. ..... Start the tape in record mode.

3. ..... Press S on the ZX81 keyboard.

First 6 seconds of silence will be recorded on the tape, then the music file. When the program returns to the MENU, the tape can be stopped. We highly recommend that you take careful notes what was recorded on the different cassettes with the tape-counter position marked as well.

8.2 Loading Music Files

1. ..... Check if the cable is connecting the EAR sockets in both the cassette recorder and the ZX81.

2. ..... Start the cassette recorder in play mode just before the beginning of the music file.

3. ..... Press L on the ZX81 keyboard.

Start the loading process during the 6 seconds silence before the data because glitches, music or other programs on the cassette can cause the program to crash and then you have to load the whole program again.

When loading is over the program returns to the MENU. Immediately the new DIRECTORY is shown with the new SUBs and MASTERs.

8. RANDOMIZE

A controlled amount of random delay can be introduced to get a more 'human-like' feeling. It is especially useful when recording unison tracks with different synthesizer settings. Having pressed R the message

RANDOM DELAY (Ø TO 255 MS) :

appears. Enter the maximal random delay in milliseconds then press NEWLINE.

If you give e.g. 4Ø ms, from this moment on whenever a new clock pulse arrives in PLAY mode (see chapter 5.) the following note will be delayed by a random time between Ø and 4Ø ms. The delay will be different for each note. The maximal random delay should not exceed about 5Ø% of the clock period otherwise a few clocks may be lost.

9. TRANSPOSE

Any SUB can be transposed by any number of semitones up or down as long as it fits into the pitch and octave range of the MUZIX81. If you press T to enter the TRANSPOSE mode, the program will first ask:

WHICH SUB ?

After entering the name of the SUB, the next question is:

HOW MANY SEMITONES ?

You can enter any number, and then press NEWLINE. For example to transpose a SUB one octave down enter -12. Do not worry whether the transposition fits into the pitch range. If it does not then a warning appears:

TRANSPOSE OUT OF RANGE

The SUB remains unaltered and you are back in the MENU again. Otherwise upon completing TRANSPOSE the program returns to the MENU without any messages.

10. KEYBOARD ADJUST

One of the handiest features of the MUZIX81 system is the KEYBOARD INPUT.

1..... Connect the CV OUT and TRIG OUT (or GATE OUT) outputs of your synthesizer to the CV IN and TRIG IN (1 or 2) inputs of the MUZIX81 box. Note, that some synthesizers will only give a control voltage and trigger out if there is no connector (jack) in their CV and TRIG inputs. In this case pull these jacks out while using KEYBOARD INPUT.

2..... In order to recognize what you play on the synthesizer keyboard the MUZIX81 first has to learn which keys belong to the different control voltages coming from your synthesizer. This is done if you press A for KEYBOARD ADJUST. The next message on the screen is

PRESS A MIDDLE C ON THE SYNTHESIZER
PRESS ANY KEY ON THE COMPUTER

The MUZIX81 accepts control voltages in the range of ØV to +5.25V. If your synthesizer's CV OUT is supposed to be greater than ØV, even for the lowest note, then press the lowest C instead of the middle one. Execute the instructions and wait a few seconds.

3..... Now a new message will appear

PRESS A 1 OCTAVE HIGHER C ON THE SYNTHESIZER
PRESS ANY KEY ON THE COMPUTER

Follow the instructions and wait again. If the response is

KEYBOARD ADJUSTMENT FAILED;
YOUR SYNTHESIZER IS NOT 1V/OCTAVE

then see Note 2. If the MENU appears without any comment then everything is OK. Now you can go to the KEYBOARD INPUT. The program will remember the adjustment until you switch the ZX81 off.

Note 2: Check the connections and cables once more. If everything seems to be in order, then measure the CV OUT of your synthesizer with a DC voltmeter. It should normally be in the ØV to +5.25V range and the 1V drop should be seen for a 1 octave step. If this is not the case consult your synthesizer manual for tuning instructions. The MUZIX81 can be tuned as well but it is carefully factory-adjusted to the 1V/octave. If you still think that it is out of tune then see Chapter 12 for SCALE ADJUSTMENT. This section will explain how to adjust both the input and output scales of the MUZIX81 box.

11. KEYBOARD INPUT

If you press K for KEYBOARD INPUT and the adjustment has not been done earlier then the message

KEYBOARD NOT ADJUSTED

appears. Do the adjustment, and press K again. The program will ask

<KBD INPUT> - WHICH SUB ?

Answer it with pressing the key of the SUB you want to use. Now the screen completely disappears waiting for you to play.

Play the line on the synthesizer. You need not be a virtuoso, play slowly but evenly. If you make an error press any key on the computer and you are back to the MENU again. Hit one more key after the last one of your musical line. It does not matter which key do you hit this time; this "after the last" key is used only for marking the end of the last note.

The program waits about 5 seconds for any more notes to follow. If there are none then the screen reappears with the question

HOW MANY CLOCKS ?

At this stage you can still abandon by entering @ . If you feel you have played correctly then count how many clock periods your line consisted of. If you played two full measures and the shortest note was an 8th then you can ente 16 (or 32 if this line is a slow one and the shortest of the notes you just played has a length of 2). Press NEWLINE and wait until the program translates your lines into the usual form. You will find yourself in SUB EDIT mode looking at the scores you just played; the earlier content of the SUB had been erased.

If more than 64 notes were played in the KEYBOARD INPUT, then the message

TOO MANY NOTES

appears and you are in the MENU again.

12. SCALE ADJUSTMENT

The MUZIX81 box has been adjusted carefully to 1V/octave but it may not match your synthesizer's scale exactly. If a scale played by the MUZIX81 is not in tune then a readjustment is necessary.

1. ..... Unscrew the bottom plate of the MUZIX81 box. You find three holes on the printed circuit board with the numbers 1,2,3 beside them. The trimming potentiometer of the fine scale adjustment can be reached through the hole No.2. with a thin screwdriver.

2. ..... Write the following notes into the SUB A:

1.ØC 1.1C 1.2C 1.3C

Then write into MASTER A **AØ:** and exit from it with COMPILE (Y). Enter PLAY mode then go through the notes one by one with the [STEP] (yellow) key of the MUZIX81 box (see 14.3). Tune the synthesizer to a tuning standard when you hear the lowest note (1.ØC). Step to the next notes and now adjust the trimmer until these notes are in tune. Repeat the procedure if necessary.

3. ..... The trimming potentiometer No.1. is the coarse adjustment, No.3. is the offset voltage. This latter is used to adjust the output to Ø mV normally when **ØC** is played. If the keyboard of your synthesizer has an offset voltage in itself, this voltage can fool the keyboard input. You will find that some of the notes you have played show up on the screen shifted by a semitone, or even a lot more notes appear than you have played. If this is the case, adjusting the offset trimmer by trial and error will solve the problem.

13. ADVANCED PROGRAMMING. SPECIAL TRICKS

(A few tricks which the authors found very useful in practice)

13.1 Clear or Copy

If you want to clear a SUB or MASTER in order to get more free memory or for writing a new one, you can delete it note by note, of course. There is a more elegant way to do it. Say you want to clear SUB A. You will certainly find an empty SUB in the system, say Q. Then call SUB EDIT Q, rename it to A, then exit from it. You will see in the DIRECTORY that SUB A is now empty,too.

In order to copy, first edit the SUB or MASTER to be copied and immediately rename it, like before.

13.2 Clear All

If you want to clear everything to start a new song, you can do it easily. But: did you save your old song to a cassette ? Press the BREAK key on the ZX81 in the lower right hand corner and the program will stop. After pressing the key R the word RUN appears at lowest line on the screen. Press NEWLINE, and the program starts again with the MUZIX81 logo.

13.3 Restart

The MUZIX81 program is protected against most illegal keyboard operations, but a in a few cases is still may happen that it stops with an error report in the lowest line. The error report looks like **4/1477** or similar. If you do not want to lose the data already in the memory, press the following keys on after the other: **G 3 Ø Ø Ø**. Now in the lowest line on the screen the text **GOTO 3ØØØ** should appear. Press NEWLINE and you are back in the MENU again.

13.4 Memory Full

If you have a lot of long SUBs and you use a 16K RAM only and you are about to edit a long SUB then the program may stop with a memory full error message. In this case the error report is **4/XXXX** , where XXXX is some number. This may occur even though in the MENU you could see a lot of free bytes. The ZX81 needs a temporary workspace which can be quite large in some cases, especially when dealing with long strings. In this case restart the program as outlined in 13.3 and continue, but for efficient operation do not write too many notes into one substring, rather use several short ones and chain them together.

14. MULTITRACK USE

14.1 Laying a Sync Track

If you want to synchronize several synthesizer or drum tracks, first record a sync track. The AUDIO CLOCK OUT gives a short beep with each clock pulse. Record it to Track 1 on a rather low level (-20dB or less) to make sure that it will not be heard on the neighbouring tracks.

If you have set the clock rate with [FREQ] and [FINE] on the MUZIX81 box, start the tape in record mode and after about 10 seconds press the [START] button. In principle you could also record the first synthesizer track at the same time on another track, but we do not recommend it for two reasons:

i/ if there is a tape error on the sync track you will not recognize it until you are in the middle of the song and you have to start all over again

ii/ there will be a small time delay (10-15 ms) between the first synthesizer track and the later ones in this case.

14.2 Synchronizing to the Tape

If the sync track is recorded in the full length of the song, connect the output of Track 1 to the AUDIO CLOCK IN socket of the MUZIX81 box. Check if the signal is coming from the sync head of the tape recorder. With the slide switch in the [INT] (left) position adjust the [GAIN] pot until the clock pulses coming from the tape appear on the clock LED. To make a sync recording:

1..... Load the next track to be played into the ZX81 and adjust the settings of the synthesizer.

2..... Push the slide switch on the MUZIX81 box to the [EXT] (right) position and press [STOP].

3..... Enter PLAY mode by pressing P.

4..... Start the multitrack recorder in record mode with next track ready.

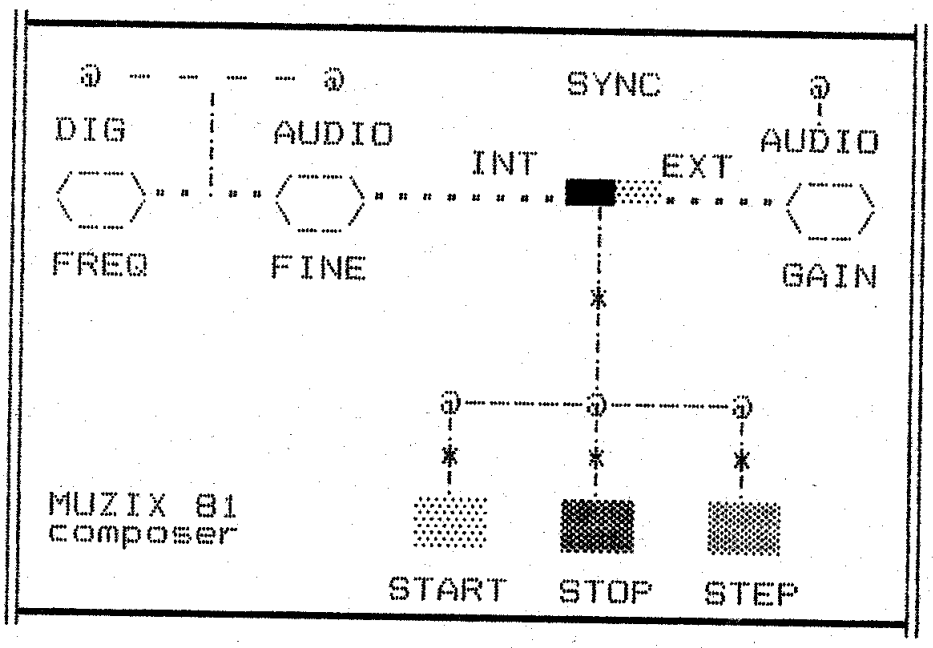
5..... Press [START] before the sync pulses from the tape begin. (For further explanations see the next section).

14.3 Start, Stop and Step Modes

The schematics of the different control functions on the MUZIX81 box is shown below. All these switches do the task of routing the sources of clock signals:

i/ Internal oscillator
frequency control with [FREQ] - coarse, [FINE] - fine.

ii/ External clock signals coming from
- AUDIO CLOCK IN (level set by [GAIN])
- pressing the [STEP] (yellow) button
- sending a digital pulse to the jack above [STEP]



When the slide switch is in the [INT] position, then the internal clock is connected to the system clock. It is not started, however; this can be done by pressing [START] (green), entering START mode this way. The little LED above [START] should light up to indicate this mode.

If external clocks arrive during this period, in order to avoid interference, the box switches the internal oscillator off and remains active to recieve the external signals in STEP mode, shown by the LED above [STEP]. When pressing [STEP] a clock signal appears at the clock outputs (both the DIGITAL and AUDIO) with a length equal to the keystroke. Pressing [START] again returns the system to START mode.

Both the START and STEP modes are terminated by pressing [STOP]. The LED above [STOP] should light up, indicating STOP mode.

When the slide switch is in the [EXT] position, then the internal clock is permanently disabled. In STOP mode all external signals are disabled as well. [START] enters START mode, enabling the external signals. In this case pressing [STEP] does not enter STEP mode, there is no such mode with [EXT] on, but it gives a pulse if the system is in START mode.

The reason for starting the multitrack first, then pressing [START] is, that inevitable small pulses coming from switching the tape recorder motor on can appear as false clock signals, stepping through the first few notes, so the system should be in a disabled state when this occurs.

15. MUZIX81 DRUMMER

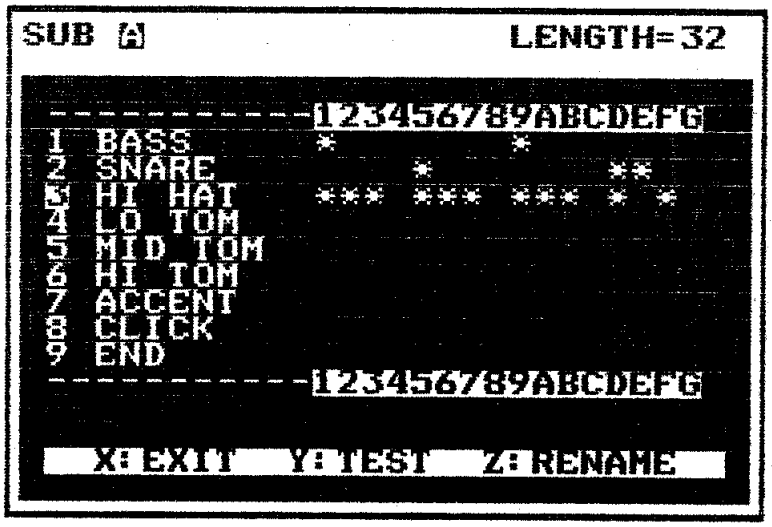
The MUZIX81 box can also control a drum box which can accept trigger signals for each drum. The DRUMMER program is very similar to the COMPOSER, so only the significant differences will be discussed here.

If you used the DRUMMER and return to use the COMPOSER, pull out the drum trigger jacks 1 to 6 from the back of the MUZIX81 box, otherwise your songs will be out of tune !

The MUZIX81 DRUMMER has 7 different trigger output and 1 accent output. The trigger outputs are 20 ms long +5V pulses. The accent is 0V to +5V, positive. Lines 1 to 6 are connected to DRUM OUT 1 to 6. Line 7 is ACCENT OUT, and line 8 is the TRIG OUT. See Section 16 for the schematics.

15.1 SUB Edit

The only significantly different programing mode is SUB Edit. Load the second side of the cassette and the MUZIX81 logo appears again. Go to the MENU, and SUB EDIT A.



On the left you can see the numbers and names of the output lines 1 to 8. The names of the drums are of course only for help, you can use the lines for any other purpose. There is a 9th line as well, named END.

One of the line numbers appears in black on white, while all others are in inverse. This shows which of the lines is actually being edited. You can move this up and down with the cursor keys (SHIFT 6 and 7). Note, that moving up above the first line causes a jump to the last one, so you can go around.

A DRUM SUB consists of 16 or less clocks. The characters

123456789ABCDEFG

belong to the 16 possible time events (as indicated on the screen) in the SUB. If you are in line 1 (bass drum) and press the key A, a white asterisk appears at the appropriate place. If you press A again, it disappears. So you can write and edit what each drum should play and at the same time you can see on the screen how they relate to each other. If the SUB is shorter than 16 clock pulses, put an asterisk into line 9 (END) to the last position which should still be played. For example, if you want to have a pause of 16 clocks than an asterisk should be placed in line 9, column G and nothing else.

There is a new option in the SUB screen, named TRY. If you press Y to enter it, you are in a 'temporary' PLAY mode, where the SUB being edited is played repeatedly. Pressing any key returns to the SUB edit mode.

15.2 MASTER Edit

The technique of the temporary transpositions in the COMPOSER program has no sense in the DRUMMER, of course. Therefore, if you use the same structure as in the COMPOSER, the program ignores the values of the numbers. For example

A0027 is exactly the same as
A0000 and both cases mean that the rhytm in SUB A

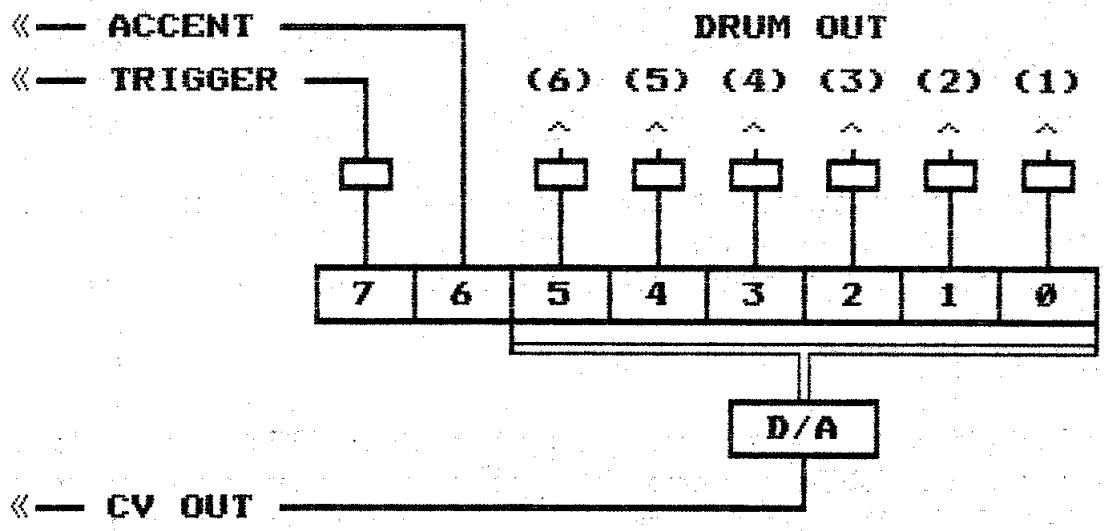
is played 4 times. Everything else is identical to the MUZIX81 COMPOSER.

16. TECHNICAL SPECIFICATIONS

16.1 Representation of Notes

Notes are stored as 1 byte numbers. The lower 6 bits (Ø to 5) contain the pitch and octave and after a digital-to-analog (D/A) converter the analog output voltage appears at the CV_OUT socket. These bits simultaneously appear separately on the DRUM outputs 1 to 6 as a 2Ø ms positive pulse.

Bit 6 of the byte is sent to the ACCENT output and the rising (positive) edge of bit 7 triggers a monostable multivibrator, generating a positive 2Ø ms pulse for the TRIGGER output. The connections are schematically shown below.



16.2 Outputs

CV_OUT : ØV to +5.25V, impedance 1 ohm [6.3 mm]
1V/octave, 1 semitone steps, nonlinearity < Ø.Ø2 LSB = 2 cent.

ACCENT : ØV or +5V, impedance 6ØØ ohm [6.3 mm]

TRIGGER 1 : switch trigger, 2Ø ms positive pulse [6.3 mm]
ON: < Ø.1 ohm, Ø V OFF: open circuit

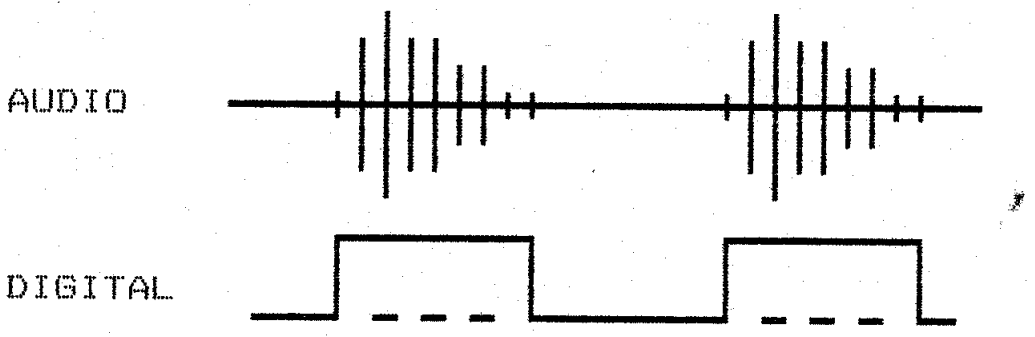
TRIGGER 2 : voltage trigger, impedance 6ØØ ohm, 2Ø ms positive pulse [6.3 mm]
ON: +5V OFF: ØV

DRUM 1-6 : 2Ø ms positive digital output pulse, impedance 6ØØ ohm [3.5 mm]
ON: +5V OFF: ØV

CLOCK_OUT

Digital : 0V to +5V square wave with 50% duty cycle,
starts with positive edge, impedance 600 ohm [3.5 mm]

Audio : 1 kHz audio signal with pulsed envelope,
400 mV peak-to-peak, impedance 600 ohm [6.3 mm].



16.3 Inputs (All input impedances are > 100 kohm)

CV_IN : 0V to +5.25V, [6.3 mm]

TRIG 1 : switch trigger, [6.3 mm]
ON: < 10 kohm, short circuit or a low impedance negative pulse
OFF: > 200 kohm, open circuit

TRIG 2 : voltage trigger, positive triggered [6.3 mm]
ON: > +3.3V OFF: < +1.2V
there will be no harm from triggering voltages up to +15V

CLOCK_IN : only audio input, level triggered [6.3 mm]
minimum threshold level 5 mV at maximal gain setting

[START], [STOP], [STEP] digital inputs: positive edge triggered [3.5 mm]
ON: > +3.3V