

SEQUE 1.0

UNIVERSAL MONOTONIC SEQUENCER

REAL TIME MODES

Now we're going to start a long discussion of sequencers.

It's going to be long because there is no single kind of sequencer that's best in every situation. Some will do better on stage and others will be more at home in a studio setting. Polyphonic sequencers should at times be structured for storing and reproducing chord sequences while at other times each channel should be treated as a separate voice. The only really workable solution is to come up with an entire "family" of sequencers.

The common limitation of all programming devices currently available is that none of them can offer this kind of versatility. But, this is an area where the system that we've developed, with its ability to accept a wide variety of personality endowing programs, will really come into its own. If we need a studio sequencer (with click track synchronization and full score editing features, etc.) we can load that program; when a chord sequencer is required, that software can be loaded.

With few exceptions, these programs will all be "complete" in that once they are running, the system loses any "computer personality" that it may have had. All of the features that the program offers will be available with one or two touches of the "command" (computer) keyboard. You can forget that the computer's there because its control keys are dedicated exclusively to functions assigned them by the program. "This key makes it play - this key makes it play faster." Easy.

To illustrate these points, we'll begin with a program called SEQUE 1.0, a monotonic sequencer

written to run on a PAIA P-4700/C or its equivalent. It can also be easily patched to run on a P-4700/J as outlined in the box.

SEQUE 1.0 is an acceptable "general purpose" sequencer (acceptable from the standpoint of our new perspective - in terms of the alternatives that are available it is the most sophisticated sequencer ever produced). It has some features tailored for live performance and others that are primarily for studio use. The program listing and some additional notes appear in following pages.

COMMAND KEYS

When SEQUE 1.0 is running, the command keys should be thought of as being labeled like this:

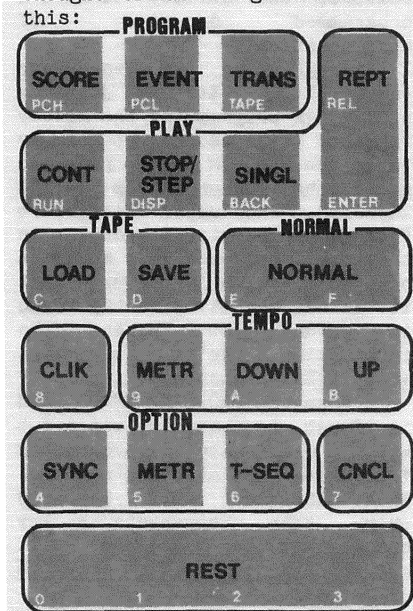


Figure 1

Undoubtedly, some of the designations on the keys still

seem a little on the cryptic side. Let's look at function and begin by pointing out some of the ways that SEQUE 1.0 is different from what you're accustomed to.

PROGRAMMING A SEQUENCE

The first way that it's different is that you don't program it with knobs, you simply enter the note sequence from the AGO keyboard. More specifically the first operating mode that we'll examine is a completely "real time" performance mode. You simply touch the "PROGRAM SCORE" key and start playing. Except for the fact that we will be able to do much magic, the result is the same as if there were a tape recorder somewhere recording what you're playing. Whatever tempo you play in, including subtle timing nuances, are faithfully captured by SEQUE 1.0 and stored in the computer memory. When you reach the point at which you want the sequence to repeat, touch REPEAT PLAY and it all comes back.

PLAYING THE SEQUENCE

Since this is a real time mode, the timing of punching up REPEAT PLAY is important. If you were storing a repeating bass line, for example, you would play the single figure that characterizes the bass line and then, at the exact point (and on the beat) where the first note of the figure was to be repeated, touch REPEAT.

There are other sequencers beginning to appear that operate this way, and if real music was played with droning bass lines that repeat unchanged, endlessly,

they would be perfectly adequate. And the music would be perfectly boring.

Not that real music doesn't frequently have the characteristic of a repeating bass figure, it does, but it's also made to sound different by transposing the figure into different keys to follow key changes in the composition. While this fact seems to have been largely ignored by sequencer manufacturers, we don't have to settle for that.

TRANSPOSING

SEQUE 1.0 has a variety of provisions for transposing the programmed sequence. The simplest of these is that while in playback mode it can accept information on key changes directly from the AGO keyboard. A little explanation.

Since we obviously want to be able to transpose both up and down in pitch, we need to decide that some arbitrary key represents no transposition (play the sequence as programmed). SEQUE 1.0 assumes that the 2nd C on the keyboard is the "0 transpose" key. keys up-scale and down-scale from this one, then, represent transpositions up and down scale respectively. press the C# above the 2nd C, and the entire sequence plays with each note a semi-tone higher than was originally programmed. Press the F below the 2nd C and then each note plays a fifth lower.

As an example of this, suppose that we were going to want to play a walking bass line as shown in figure 2.

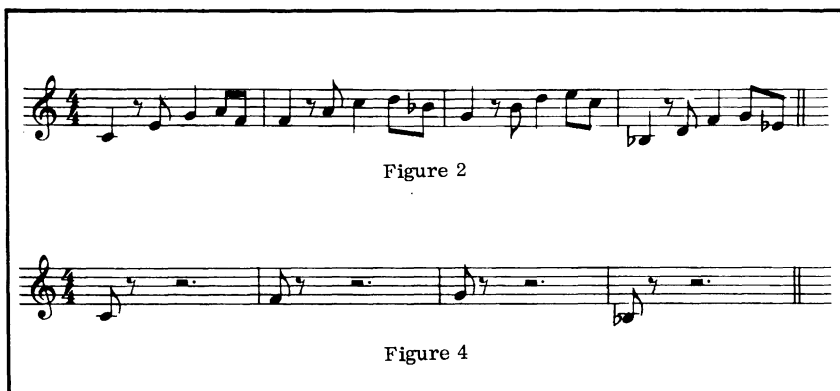
Because of the things we've talked about already, it should be relatively obvious that we only need to really "play" this much of the entire bass line:



(NOTE: Do not hit this note!
Hit repeat at exactly the time
you would have played it.)

Figure 3

because from then on it simply repeats, transposed into



different keys. As the riff from figure 3 plays, we can extend it out to the entire bass line simply by pressing keys on the AGO keyboard to perform the appropriate transpositions at the proper time. Like that shown in figure 4. Pretty exciting. And we really haven't even started yet.

THE TRANSPOSE SEQUENCE

While being able to transpose the programmed sequence with real time keyboard entries will be plenty useful again and again, there are also going to be times when it will be at best a pain in the neck. You'll be busy doing other things. For these times, SEQUE 1.0 offers another feature, the ability to save a programmed sequence of transpositions.

Programming the T-sequence (as we'll call it) is just as simple as programming the melody sequence (M-sequence), you simply touch the PROGRAM TRANS pad and enter the sequence from the AGO keyboard. The major difference from a programming standpoint is that the T-sequence is a sequence of events, which is to say that it is not sensitive to the tempo in which you enter the information. We'll talk more about EVENT sequences later.

When the PROGRAM TRANS pad is first touched, it wipes out any previously programmed T-sequence and starts a new one. Each subsequent AGO keyboard entry then represents a key change that the M-sequence will go through at the point at which it repeats.

During the programming of a T-sequence, the displays count to show where we are in the sequence, and the note corresponding to the

transposition will play while the key is held down. When the key is released, the note stops completely, so that there is no possibility of confusing this programming mode with others.

On playback, the M-sequence will be played completely through, transposed to the key signature corresponding to the first T-sequence entry; then completely through transposed by the second T-sequence entry, then the third, etc. When the end of the T-sequence is reached, the whole thing starts over again with the first note and the first T-sequence entry. To go back to our walking bass line for a moment, the T-sequence would program like this:



Figure 5

In the terms which we will find most useful, enabling the automatic transpose is an OPTION which may be selected along with one or more of the major operating MODES. If we want to assert the T-sequence option during playback we do so by touching the T-seq. OPTION key. To stop the T-sequence and revert to the manual entry of transpositions, simply touch the OPTION CANCEL pad.

It is important to note that canceling the T-seq. option simply keeps the system from invoking the T-sequence, and does not in any way alter the sequence as stored. You can turn the option on and off as many times during a set as desired.

And still there's more.

SINGLE PLAY

There will be times when we don't want the sequence to repeat endlessly, but simply to play one time through and stop. A SINGLE PLAY MODE.

An important difference between the two modes is that whereas REPEAT begins playing the sequence as soon as it is touched, SINGLE PLAY waits for an AGO key to be pressed and then plays.

The T-sequence option may also be asserted in the SINGLE PLAY MODE, but it has been my experience that it's not tremendously useful. Much more useful is to have the T-seq. option cancelled (which selects the AGO keyboard as the transposition source), so that pressing an AGO key not only starts the sequence playing, but causes it to play in the key selected.

Releasing the key which initiated the sequence will not cause it to stop (once started it always plays to the end), but pressing a different key in the middle of the sequence will immediately transpose it to a new key signature.

TEMPO KEYS

The function of the TEMPO UP and TEMPO DOWN keys is just what you would expect. Touch TEMPO UP and the tempo of the sequence being played doubles. Touch it again and the tempo doubles again. Touch TEMPO DOWN and the tempo rate is divided in half.

If not over-used, these two keys will increase and decrease tempo while still keeping relative timing of notes unchanged; however, raising the tempo too high will cause some timing information to be lost and will cause the notes to be "jammed" together so that synchopation will change. Beware and be aware that this fact has special effects implications - there may be times when you want to do just this.

TAPE SAVES AND LOADS

The TAPE pads control a couple of operating modes which should also be useful. TAPE SAVE causes the M-sequence and T-sequence information currently in the computer's memory to be dumped to magnetic tape. when you come up with a "keeper" start

your recorder going (recording) and touch TAPE SAVE. After a short leader and synchronizing tone is generated, the displays will start to count and within a few seconds your complete composition will be stored as data on the tape (a hint - always save things twice)

Loading a composition that was previously saved on tape consists of playing the tape and touching the TAPE LOAD command pad. As with the saving operation, the displays count as the data transfers from tape to memory. If, after loading a tape, you punch up PLAY MODE and nothing happens, it means that the load was unsuccessful. Try again with the second copy (and review the "tape selection" section of PAIA's CS-87 POT SHOT manual).

NORMAL MODE

NORMAL is simultaneously the most straightforward and ubiquitous of all the operating modes. NORMAL is nothing more than a normal monotonic synthesizer function, the important point is that asserting this mode of operation does not alter previously programmed M or T sequences. It simply ignores them as long as this mode is selected. at any time you can punch-up SINGLE or REPEAT PLAY and do that magic and with a touch of the NORMAL pad be back to plain synthesizer.

SUBTLETIES AND TRICKS

It seems to me that a sequencer for use on stage should have two major design goals: it should be easy to program and operate (which SEQUE 1.0 certainly is) and it should enable the user to do a better job of the thing he's there to do - put on a show. As theatrical a show as possible. SEQUE 1.0 has several of these "show" features.

The ability to shift back and forth between the various modes of operation (and specifically the availability of the NORMAL mode which doesn't mess up programmed sequences) is definitely one of these.

Others are less obvious, for example:

When you have the T-sequence option selected (so that transpositions come from their programmed sequence) and you go directly from the PROGRAM SCORE.

mode to REPEAT PLAY without first asserting another operating mode, the first entry of the T-sequence will be skipped and the melody sequence will begin playing immediately transposed by the second entry in the Transpose Sequence.

Why?

Because, when you entered the characteristic sequence it was equivalent to its being played the first time through (which would have been done using the first T-sequence entry). When you hit REPEAT PLAY and the computer takes over, it is in effect playing the sequence the second time - which should be done in the key of the second T-sequence entry.

The major application here is to allow you to enter (during set-up and tuning) a T-sequence for the number that you are going to be doing and then enter the actual sequenced figure extemporaneously. We all know how great it is when the magic is working and everybody's really cooking. This feature allows your automation equipment to tap into that energy and the innovation that frequently results from it.

If for some reason you don't want to skip the first T-sequence entry, you simply terminate the PROGRAM SCORE mode with a command other than REPEAT PLAY (NORMAL, for instance; or SINGLE PLAY), then punch into REPEAT PLAY. Remember always, though, that the termination of PROGRAM SCORE mode must be done "in tempo" if the timing of the playback is to be correct.

Here's another special application:

In most cases, the M-sequence is reserved for the melody, but the UP TEMPO command allows you to enter some short riff (live, yet) then speed the sequence up to the point that it has the effect of being a "voice" of its own. By then punching into SINGLE PLAY mode, the sequence can then be used as you would a single note, which you "play" by transposing it. Naturally, the T-seq. option should be cancelled for this.

And another:

REPEAT PLAY mode always starts the M and T sequence from the beginning, making it any easy matter to use the first few bars of the sequence again and again, for introductions, bridges, and special effects.

STUDIO MODES

Now we turn our attention to the studio-oriented options offered by this "universal" monotonic sequencer program.

Some of the distinctions between stage and studio use are somewhat arbitrary.

For example:

EVENT PROGRAM

The real-time SCORE melody programming mode that we examined in the first section of this piece can obviously be used in a recording studio as well as it can on stage, providing that you're interested in recording only those things that are within the limits of your physical abilities. But the real promise of a small studio (or a big one, for that matter) is that it allows us to produce music that we don't have the chops to do in real time. After all, not everyone has the hours per day that it takes to gain physical mastery of a keyboard - but that doesn't mean that we don't have valid musical ideas, only that we need a little help in expressing them.

If a recording studio is a single thing, it's a time machine that allows days or weeks of work to be compressed into a few minutes of music. One of the programming modes that we have available (EVENT) is specifically designed to operate in this type of time-compression environment. In this mode we enter the music not so much as a melody, but as a series of notes and rests. A series of events which, when reproduced by the computer, turn out to be a melody (maybe).

There is of course nothing new about this mode of operation, this is the way sequencers have always worked. About the only new part is that instead of entering the events as positions of a knob or a series of numbers, we have an AGO keyboard on which to program.

Touching the command keyboard's PROGRAM EVENT pad puts us in this programming mode. (See Figure 1.) Melody lines are entered much as they were with the SCORE mode, except that the computer is no longer watching for how long we hold a key down

or how rapidly the notes are played. It is now only interested in whether a key is up or down.

One of the major implications of this is that notes in the melody are "jammed" together in time, and on playback will come out exactly equally spaced, one note per beat. While this is OK in some cases, as a general rule it is unacceptable; because it is unacceptable, we have a REST pad on the command keyboard. The REST pad provides for syncopation. It is a means of "extending" an event so that it takes more than a single beat.

If you're familiar with the operation of the rest key on something like PAIA's Programmable Drum Set, you already have a good idea what's going on, but there still are some surprises here.

Your first thought may be that when you press and release a key on the AGO keyboard, that constitutes an event. Actually, it's two events as far as SEQUE 1.0 is concerned - the first when the key was pressed and the next when it was released. It's important to keep in mind that the REST pad can extend either of these events.

For example, this simple phrase:



Figure 6

would be entered from the keyboard by pressing F and releasing, press A and release, press C, release, press D, release, press F and while holding the F key down, hit the REST block on the keypad, release the F key, tap the REST block, play A, touch the rest block before letting up the A key, release the key, and hit the rest block once more. The measure is now completely entered, and may be played by using the REPEAT or SINGLE keys as described last time. Note particularly that on the fifth note (the second F) where we wanted to extend the note to a full beat, the REST pad had to be touched twice; once to extend the "key down" event and again to extend the "key up" event.

At first, having to enter two RESTs when we actually want to extend a note for a single beat may seem a pain in the neck (undeniably, it is) but the slight inconvenience buys us a number of things. For example, the ability to slur notes.

In the above example, the D could have been slurred into the F by first touching the REST pad before releasing the D key. This will lengthen the note to occupy the time normally used when the key is released. Then press the F key before releasing the D. This will cause the D to be entered in the next time slot without any articulation (triggering). Now, while holding the F key, touch the REST pad to lengthen it to a quarter note as covered earlier. After releasing the key, enter the additional REST required and proceed as usual.

Having each REST pad activation correspond to a "half" event (kind of) also allows us to produce dotted notes as the exceptions that they are rather than having to make specific tempo provisions for them which must be carried over to all notes in the sequence.

It is also possible to generate articulation changes whenever a note is extended beyond a basic "dual" event. If, for example, you are generating a series of notes where each note uses a key depression plus a REST and a key release plus a REST (four events), these notes can be performed in three different manners. If entered as listed above, the note has equal time allotted for note performance and release. For a staccato style, the note could be entered with a key depression, release, and then two RESTs. For legato styles, the two RESTs could be entered while the key is held down, yielding three "on" events and one "off" event. Each of the above would occupy the same execution time during playback, but would reflect the different articulation styles.

Once the melody is in the computer's memory, it makes no difference whether it got there with SCORE or EVENT programming modes as far as the playback and options are concerned. All of

these features (real time or programmed transpositions, single or repeat play, tempo up and down, and tape saves or loads, etc.) work the same.

CLICK TRACK SYNC

Even more powerful in the studio than the EVENT programming mode are the features added by two other command pads; CLIK and (in the option box) SYNC. These provide a means of synchronizing multiple tracks of sequencer operation.

Once you start using a sequencer for recording, you begin to find more and more places where it can be used to relieve a lot of tedium. The problem in the past has been that it is, for all practical purposes, impossible to manually synchronize a sequencer to a track that's already on tape. Even slight differences in tempo soon build up to an intolerable variation in when a note is supposed to happen and when it actually does happen. Maybe there are people who could manually twiddle a tempo knob and keep things locked together, but that's a hassle.

Most of us are familiar with the classical "click track" approach in which a metronome-like "tick" is recorded on one track of a tape so live musicians can easily maintain the tempo of the original work in over-dubs. Our CLIK and SYNC command pads are simply this old concept extended into the realm of automation.

Touching the CLIK pad causes SEQUE 1.0 to begin producing a very rapid series of "clicks" that are machine readable and represent a standard clock rate which the SYNC option can read and synchronize to. The click appears at the normal cassette output jack (where programs, etc., that are to be saved to tape come from) and when using this option, this output is tied to one of the channels of the tape recorder on which you're recording your audio tracks.

To use the click track option, the tape that you will be recording and mixing your audio onto must always be prepared first; you can't record a lead part and then come back and lay down the click, it won't work like that. Before doing anything else, connect the 8700's cassette output to the input of one track

of your recorder, start the tape rolling in record mode, and after allowing a comfortable quiet leader, punch the CLIK pad. Allow the tape to run much longer than you think you'll ever need for what you're going to be recording, one thing you don't want to do is run out of click in the middle of things.

Synchronizing to the click track is simply a matter of connecting the output of the tape channel that contains the click to the normal cassette input jack of the computer, but note that some juggling of the record and playback levels of this channel may be necessary for the computer to properly write and read the channel. In many cases, unless your recorder is capable of providing very high outputs (similar to the earphone levels from the cassette recorders which the computer was designed to work with), you may need to use a small external amp to provide the extra gain and current drive required. If your SYNC fails to respond, try using the earphone jack signal usually provided on multi-track recorders. If this doesn't provide enough power, try using a small portable practice amp (such as a Pygmy or Pignose) whose earphone output should adequately drive the cassette input jack of the computer.

Assuming that you have some rhythm sequence (ordinarily the first laid down) in the computer memory and that you're getting ready to record it as audio, proceed by first punching into the T-SEQ option (if you plan to use it) then touch the SYNC control pad. Roll the tape with the click track channel set to playback and the audio going to one of the other tracks which is naturally in record mode. Before the quiet leader ends, touch the REPT/PLAY command pad and hold it. When the click track starts, so will the sequence. When enough of the track is laid down, terminate the play mode by touching the NORMAL pad.

It is necessary to select the SYNC OPTION last in the above sequence of events because once this option is asserted, a click track must be coming in on the cassette port for the computer to recognize any further commands. If you find yourself with a "dead" computer caused by CLIK being selected with no click track present, you can either run a tape which has a click track or

reset the computer and run the program again.

In situations where the sequence is not to be played from the first down-beat, the SYNC OPTION should be enabled before rolling the tape and REPT/PLAY punched in when the time comes for the sequence to start.

A little constructive play will go a long way toward familiarizing you with the capabilities of this powerful option. Here are some we haven't mentioned yet:

You have probably already noticed the somewhat cryptic METR designations that appear in both the OPTION and TEMPO control boxes. And probably you've figured out that it means metronome (a handy thing in any studio). But this is kind of a super metronome because not only does it have a "pendulum" (which shows in the computer's twin displays) and an audible click (which you hear from the beeper) but it also provides an electrical output in the form of a short positive going pulse that appears as D7 of the D/A output channel (which in turn shows up on the Flag 2 pin jack of the D/A's front panel). This pulse is enormously useful in synchronizing external devices (a Programmable Drum Set, for example).

Since both the SYNC and METR options may be asserted at the same time, the external device can be synced to a pre-recorded audio track.

The METR pad in the TEMPO control box is obviously the tempo control for the metronome. Like the other tempo controls that we looked at last time, this one works in octaves. Each time the pad is touched the metronome tempo doubles until the maximum rate is reached, then the next touch causes the tempo to "fold back" to the minimum rate.

It may be somewhat out of sequence (?) to mention here that the tempo of the metronome is the tempo at which sequences stored in EVENT mode will play back, though of course, the TEMPO UP and DOWN command pads will also alter the tempo of the sequence once saved, as outlined last time.

Another point - When electrically synchronizing things to the click track, the METR TEMPO can still be varied to accomodate different timings, and since it operates by octaves the

integrity of the timing will be preserved.

And a hint - the metronome "beep" can also be recorded on tape to provide a "human readable" click track (though it must be saved on a different track than the CLIK).

The only other command pads that we've added are STOP/STEP (a means of stopping the sequence without "forgetting" where we were as well as single stepping through the sequence) and CONT (continue) which allows us to pick up from the point where we STOPped. This feature can provide easy introductions to songs. STOP/STEP through the piece until you reach the REST just prior to the point where the introduction should start. When the CONTINUE pad is touched, the introduction will play, leading into the repeating sequence.

<div> SEQUE 1.0 COMMAND SUMMARY </div>	
PROGRAM	OPTIONS
SCORE - Saves melody sequence in real time. EVENT Saves melody sequence as regularly spaced events. TRANPOSE - Saves transpose sequence as events.	TABLE - Selects transpose sequence table as source of transpositions (otherwise AGO is source). METRONOME - Initiates visual metronome display and a "beep". SYNC. - Shuts down internal timing and accepts pre-recorded click-track for timing information. CANCEL - Turns all selected options off.
PLAY	TEMPO
REPEAT - Plays sequence from beginning, cycles until stopped. SINGLE - Waits for key on AGO then plays sequence from the beginning. Stops at end of melody. STOP/STEP - Allows stops or pauses during playback. CONTINUE - Starts melody playback from where you are in memory.	UP - Doubles tempo of melody sequence. DOWN - Halves tempo of melody sequence. METRONOME - Doubles speed of metronome display and "beep"
TAPE	MISC
SAVE - Dumps current Melody and Transpose sequences to mag. tape. LOAD - Loads M & T sequences from tape.	NORMAL - The "normal synthesizer" mode. Does not alter stored sequences.

LOADING SEQUE 1.0

LOADING FROM TAPE

Because part of the SEQUE 1.0 program is held on the same page that the 6502 processor uses as a stack register, some very slight preparation is required before the SEQUE 1.0 tape can be loaded. Specifically the stack pointer which is used by the PIEBUG monitor program and the stack pointer associated with the applications program must be set to assure that the stack will not over-write the program. And, as long as we are setting the stack pointer, the status register may as well be set to a known state.

These objectives may be met by these keyboard manipulations:

0-0-E-D-DISP-F-F-ENT this sets the monitor stack
0-0-F-E-DISP-F-F-ENT-0-0-ENT this sets the user stack and status register.

On the tape supplied, SEQUE 1.0 is saved with the identifier 01; and should be loaded to memory from location \$0000 to \$0280 using this entry sequence:

0-0-0-0-0-2-8-0-0-1-1-1-TAPE

The program is saved in triplicate so if the first copy won't load for some reason you can always try for the next. All copies have the same identifier 01. If you experience continued difficulties in loading, refer to the POT-SHOT cassette interface manual.

HAND LOADING

If you are absolutely unable to load the program from this cassette, return it for a replacement. Since transit time back and forth may present unbearable delays, you may consider hand-loading the program and dumping your own tape (which goes a long way toward eliminating any problems caused by differences in tape recorders). To assist you should this solution become desirable, a hexadecimal dump of SEQUE 1.0 is provided below. NOTE that even if you hand load the program, the stack and status register setting manipulations outlined above should be performed before you start loading the program.

With the stack pointers and status register set, the program may be hand loaded as outlines in the various 8700 manuals:

First the programming on page 0:

0-0-0-DISP-A-9-ENT-0-0-ENT-8-5-ENT- (etc.)

Then page 1:

1-0-0-DISP-8-5-ENT-1-0-ENT-8-5-ENT- (etc.)

And finally page 2:

2-0-0-DISP-8-D-ENT-0-6-ENT-1-2-ENT- (etc.)

Note that none of these blocks go all the way to the end of the page.

When done loading, immediately save the program to tape from \$0000 to \$0280. Do this before running the program to avoid the unpleasant experience of having some incorrectly copied code wipe out the program. Next verify the program by stepping through it and comparing memory contents to the hex dump. Finally, when you're sure that it's entered correctly and have a copy on tape just in case, run it.

RUNNING THE PROGRAM

Location 0 is both the hard start and the soft start location for this program.

0-0-0-0-RUN.

If the program crashes (as perhaps when SYNC is selected with no synchronizing tape input) it may be re-started from this same location without losing any melody or transposing sequences that had been saved to that point. Re-starting from this location will cancel any options which may have been selected and will cause SEQUE 1.0 to come up in its NORMAL mode.

RUNNING SEQUE 1.0 ON A P-4700/J

SEQUE 1.0 may easily be modified to run on a polyphonic system (though it will still be a monotonic sequencer) simply by changing the address of the output port which appears at SEQUE 1.0 locations \$14B & \$14C. Changing this address to \$09FF will cause the output to appear at QuASH channel #1. This may be accomplished as follows:

1-41B-DISP-F-F-ENT-0-9-ENT

If you make this change, you should also save the altered program to tape.

A fully documented assembler listing of SEQUE 1.0 starts on the following page.

SEQUE 1.0 HEXADECIMAL DUMP

PAGE 0

000- A9 00 85 E2 A9 0C 8D 7B
008- 11 4C 18 11 B0 05 E5 E6
016- 8D 20 08 A5 EC D0 04 A5
024- EB 29 3F 85 EB 68 B0 0A
032- 85 E6 85 EB 85 E7 A9 00
040- 85 E2 A6 E7 8E 20 08 A5
048- EC F0 06 C5 EB F0 05 E6
056- E7 9D C8 02 85 EB 68 20
064- 84 11 E6 E5 68 20 AC
072- 11 AD 14 11 C5 E3 D0 02
080- E6 E9 24 E2 30 0A A5 EC
088- F0 02 85 E4 A5 E4 85 E6
096- E6 E5 68 90 04 A5 EC D0
104- D0 20 46 10 A5 EA D0 08
112- A9 00 85 E5 A6 E8 B0 01
120- 03 85 EB 68 A9 7E D0 02
128- A9 3E 4C 00 12 18 A5 E5
136- 65 E1 85 E5 A5 E3 8D 7B

090- 11 60 B0 0E A9 FF 85 E5
098- 20 B6 11 8E 20 08 A9 00
106- 85 E6 68 B0 02 85 E3 20
114- 84 11 A5 E5 D0 05 18 65
122- E1 85 E5 68 85 E9 A5 E2
130- 09 8D D0 0E A5 E2 09 40
138- D0 08 A5 E2 09 01 D0 02
146- A9 00 85 E2 4C 0F 12 18
154- 20 25 1E 68 4C 54 12 4C
162- 20 12 4C 33 12 FF FF 00
170- 00 04 00 00 00 00 00 00
178- 00 00 00 00 00 FF FF FF

PAGE 1

100- 85 10 85 85 C2 BC B4 C8
108- CF D4 80 7C DA D7 0C 0C
116- 45 92 63 46 3F A3 1E 46
124- 85 E2 48 0A 10 22 C6 DF
132- 10 1E A6 E1 CA 86 DF A9
140- 80 AA 18 65 E0 85 E0 10

130- 0C A5 EB 09 80 85 EB 18
138- 20 25 1E A2 08 8E 20 08
146- A5 E6 F0 03 18 69 A4 18
154- 65 EB 8D 40 08 68 6A 90
162- 06 20 49 1E 4C 6D 11 2C
170- 10 08 10 FB AD 10 08 30
178- FB 2C 10 08 30 85 50 F9
186- AD 10 08 85 EC 20 00 1F
194- B0 06 B9 00 11 8D 7B 11
202- A9 00 20 03 00 AD 7B 11
210- 85 E3 D0 94 B0 09 8D 01
218- 03 85 E8 85 E6 85 EB A5
226- E5 A6 E8 9D 00 03 20 13
234- 10 29 7F D0 01 03 F0 08
242- E8 E8 86 E8 9D 01 03 A9
250- 00 85 E5 68 B0 88 85 E4
258- 85 E9 85 EA 85 E5 A5 E5
266- A4 E9 A6 EA D0 02 03 90
274- 15 A9 00 85 E5 E8 E8 86
282- EA E4 E8 D0 09 C8 C4 E7

1D0- B0 DE 84 E9 D0 DC BD 03
1D8- 03 85 EB B9 C0 02 85 E6
1E6- 60 FF 00 FF 03 C0 02 C0
1F4- 02 FF FF FF FF FF FF FF

PAGE 2

200- 8D 06 12 A2 00 18 7E 02
208- 03 E8 E8 E4 E8 D0 F6 A5
216- E3 8D 7B 11 68 A2 07 B0
224- E1 11 95 F0 CA D0 F8 6D
232- 20 15 12 A5 E8 8D 00 03
240- A5 E7 8D 01 03 A9 D0 20
248- 46 12 68 20 15 12 A9 11
256- 20 46 12 AD 00 03 85 E8
264- AD 01 03 85 E7 68 20 AA
272- 1E AD 0F 11 8D 7B 11 18
280- 20 22 1F 68 85 DF 66 E1
288- 90 02 66 E1 D0 B1 FF FF

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0010 *****
0020 *
0030 * SEQUE 1.0 *
0040 *
0050 * MONOTONIC SEQUENCER PROGRAMS *
0060 *
0070 * BY *
0080 * JOHN S. SIMONTON, JR. *
0090 *
0100 *(C) 1978 PAIR ELECTRONICS, INC*
0110 * ALL RIGHTS RESERVED *
0120 *
0130 *****
0140
0150 :DEFINE ADDRESSES OF LABELS
0160
0170 BEEP .DL 1F22
0180 DECD .DL 1F00
0190 CASS .DL 1EAA
0200 DBIT .DL 1E49
0210 SBIT .DL 1E25
0220 OUTP .DL 0B40
0230 DSP .DL 0B20
0240 KBD .DL 0B10
0250
0260 MTB3 .DL 0303
0270 MTB2 .DL 0302
0280 MTB1 .DL 0301
0290 MTBL .DL 0300
0300 TTBL .DL 02C0
0310
0320 BUFF .DL 00F0
0330 KBUF .DL 00EC
0340 PBUF .DL 00EB
0350 MPNT .DL 00EA
0360 TPNT .DL 00E9
0370 MEND .DL 00E8
0380 TEND .DL 00E7
0390 TRNS .DL 00E6
0400 CNTR .DL 00E5
0410 TTRN .DL 00E4
0420 LSTL .DL 00E3
0430 STUS .DL 00E2
0440 TPO .DL 00E1
0450 METF .DL 00E0
0460 MTRC .DL 00DF
0470 DUMY .DL 0003
0480
0490
0500
0510 OR 1000
0520
0530 STAR LDA 00 :START / RESTART
0540 STA *STUS :CANCEL OPTIONS
0550 LDA 0C :NRMAL COMMAND LINK
0560 STA ACTN+01 :PLACE COMMAND LINK
0570 JMP COM :JUMP TO COMMON
0580
0590 :NORMAL OPERATING MODE - DOES NOT ALTER
0600 :T-SEQUENCE OR M-SEQUENCE
0610
1000- 00 05 0620 NRM1 BCS NRM1 :FIRST PASS THROUGH
1002- 05 E2 0630 STA *TRNS :ZERO TRANSPOSE
1004- 09 0C 0640 STA DSP :AND DISPLAYS
1006- 80 7B 11 0650 NRM1 LDA *KBUF :CHECK FOR NOTES
1008- 4C 18 11 0660 NRM2 BNE STOR :ZERO- NO NEW KEY
1009- 0670 LDA *PBUF :SO GET OLD KEY
0680 AND 3F :CLEAR BOTH FLAGS
1010- 0690 STOR STA *PBUF :SAVE AGAIN
0700 RTS :AND RETURN
0710
0720 :PROGRAM TRANSPOSE MODE - NOTE PLAYED
0730 :IS "KILLED" WHEN KEY IS RELEASED
0740
101E- 00 0A 0750 TLOD BCS TL1 :FIRST PASS, INITIALIZE
1020- 05 E6 0760 STA *TRNS :ZERO TRANSPOSE FIGURE
1022- 05 EB 0770 STA *PBUF :ZERO OUTPUT NOTE
1024- 05 E7 0780 STA *TEND :ZERO TABLE END POINTER
1026- 09 00 0790 LDA 00 :TURN T-SEQUE OPTION
1028- 05 E2 0800 STA *STUS :ON
102A- 06 E7 0810 TL1 LDX *TEND :GET TRANSPOSE POINTER
102C- 0E 20 08 0820 STX DSP :SHOW IT

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102F- 05 EC 0830 LDA *KBUF :GET THE NOTE
1031- 00 06 0840 BEQ TL2 :ZERO- NO KEY, SAVE
1033- 05 EB 0850 CMP *PBUF :KEY SAME AS LAST?
1035- 00 05 0860 BEQ TRTN :YES - LEAVE
1037- 06 E7 0870 INC *TEND :POINT TO NEXT LOCATION
1039- 90 C0 02 0880 TL2 STA TTBL,X :SAVE TRANSPOSE
103C- 05 EB 0890 TRTN STA *PBUF :AND OUTPUT AS NOTE
103E- 60 0900 RTS :THEN RETURN
0910
0920 :PROGRAM SCORE MODE - USES REAL-TIME CLOCK
0930
103F- 20 04 11 0940 MSAY JSR MSV1 :CALL SAVE MODULE
1042- 06 E5 0950 INC *CNTR :INCREMENT THE TEMPO
1044- 60 0960 RTS :COUNTER AND RETURN
0970
0980 :CONTINUE PLAY MODE - DOES NOT RESET
0990 :M-SEQUENCE OR T-SEQUENCE POINTERS
1000
1045- 38 1010 CNTU SEC :SKIP INITIALIZATION
1020
1030 :REPEAT PLAY MODE - WHEN FIRST ENTERED
1040 :M-SEQ AND T-SEQ POINTERS ARE SET TO ZERO
1050 :BY THE PLAY MODULE (PLA1)
1060
1046- 20 AC 11 1070 RPLA JSR PLA1 :CALL PLAY MODULE
1049- 00 14 11 1080 LDA STBL+14 :WAS THE PREVIOUS MODE
104C- 05 E3 1090 CMP *LSTL :MSAY (PROG. SCORE)?
104E- 00 02 1100 BNE RPL1 :NO-SKIP INCREMENT
1050- 06 E9 1110 INC *TPNT :INC. T-SEQ POINTER
1052- 24 E2 1120 RPL1 BIT *STUS :T-SEQ ASSERTED ?
1054- 30 0A 1130 BMI ROUT :OPTION ON - LEAVE
1056- 05 EC 1140 LDA *KBUF :OPTION OFF- GET NOTE
1058- 00 02 1150 BEQ OLDK :AND IF NO NOTE, BRANCH
105A- 05 E4 1160 STA *TTRN :SAVE NOTE FOR NEXT TIME
105C- 05 E4 1170 OLDK LDA *TTRN :GET LAST ACTIVE NOTE
105E- 05 E6 1180 STA *TRNS :USE AS TRANSPOSE
1060- 06 E5 1190 ROUT INC *CNTR :INCREMENT TEMPO COUNTER
1062- 60 1200 RTS :AND RETURN
1210
1220 :SINGLE PLAY MODE - WAITS FOR AGO KEY
1230 :THEN PLAYS SEQUENCE ONCE THROUGH
1240 :TRANSPOSED TO INDICATED KEY
1250
1063- 90 04 1260 SING BCC SNG1 :FIRST PASS, BRANCH
1065- 05 EC 1270 LDA *KBUF :AGO KEY DOWN ?
1067- 00 D0 1280 BNE RPLA :YES - PLAY SEQUENCE
1069- 20 46 10 1290 SNG1 JSR RPLA :NO - "PLAY" THEN RETURN
106C- 05 EA 1300 LDA *MPNT :M-SEQ POINTER > 0 ?
106E- 00 00 1310 BNE SRTN :YES - RETURN
1070- 09 00 1320 LDA 00 :NO - PREPARE
1072- 05 E5 1330 STA *CNTR :ZERO TEMPO COUNTER
1074- 06 E8 1340 LDX *MEND :POINT TO LAST NOTE
1076- 00 01 03 1350 LDA MTBL,X :OF M-SEQ AND GET IT
1079- 05 EB 1360 STA *PBUF :PLACE IN PLAY BUFFER
107B- 60 1370 SRTN RTS :THEN RETURN
1380
1390 :UP TEMPO AND DOWN TEMPO - COMMON PORTION
1400 :OF BOTH PROGRAMS ON PAGE 2
1410
107C- 09 7E 1420 UTHP LDA 7E :THE OP-CODE FOR ROR
107E- 00 02 1430 BNE U/D :BRANCH ALWAYS
1080- 09 3E 1440 DTHP LDA 3E :THE OP-CODE FOR ROL
1082- 4C 00 12 1450 U/D JMP TCOM :JUMP FOR THE REST
1460
1470 :REST MODE - EXTENDS NOTES OR UN-NOTES
1480 :WHEN IN PROGRAM EVENT MODE
1490
1085- 18 1500 REST CLC :PREPARE FOR ADDITION
1086- 05 E5 1510 LDA *CNTR :GET TEMPO COUNTER
1088- 05 E1 1520 ADC *TPO :ADD TEMPO VALUE
108A- 05 E3 1530 STA *CNTR :PUT COUNTER BACK
108C- 05 E3 1540 LDA *LSTL :AND RETURN TO
108E- 80 7B 11 1550 STA ACTN+01 :PREVIOUS OPERATING
1091- 60 1560 RTS :MODE
1570
1580 :STOP/STEP MODE - STOPS PLAY WITHOUT
1590 :CHANGING POINTERS. SINGLE STEPS THROUGH
1600 :SEQUENCE
1610
1092- 00 0E 1620 STEP BCS STP1 :NOT FIRST PASS-BRANCH
1094- 09 FF 1630 LDA 0FF :SET TEMPO COUNTER AT
1096- 05 E5 1640 STA *CNTR :"TIMED OUT" VALUE

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1098-	20 06 11	1650	JSR CONT	:CALL PART OF PLAY MODULE	1127-	A9 00	2980	LDA 00	:TO DETERMINE ALTERNATE DISPLAY
1098-	0E 20 08	1660	STX DSP	:DISPLAY M-SEQ POINTER	1129-	AA	2990	TAX	:CYCLE AND "PENDULUM" LEFT
1098-	A9 00	1670	LDA 00	:MAKE TRANSPOSE VALUE	112A-	18	3000	CLC	:PREPARE FOR ADDITION
1098-	05 E6	1680	STA *TRNS	:EQUAL TO ZERO	112B-	65 E0	3010	ADC *METF	:ADD FLIP-FLOP VALUE
1092-	60	1690	STP1 RTS	:AND RETURN	112D-	05 E0	3020	STA *METF	:SAVE NEW VALUE
		1700			112F-	10 0C	3030	BPL MET1	:ALTERNATE? - DISPLAY
		1710		:PROGRAM EVENT MODE - SAVES M-SEQUENCE	1131-	A5 E0	3040	LDA *PBUF	:OTHERWISE, GET OUTPUT
		1720		:BUT SUBSTITUTES EVENT CLOCK FOR REAL-TIME	1133-	09 00	3050	ORA 00	:SET D7
		1730		:CLOCK	1135-	05 E0	3060	STA *PBUF	:SAVE IN PLAY BUFFER
		1740			1137-	18	3070	CLC	:PREPARE AND
10A3-	00 02	1750	ESAY BCS ES1	:FIRST PASS, INITIALIZE	1138-	20 25 1E	3080	JSR SBIT	:CALL BEEP
10A5-	05 E5	1760	STA *CNTR	:TEMPO COUNTER AS ZERO	1138-	A2 00	3090	LDX 00	: "PENDULUM" RIGHT
10A7-	20 04 11	1770	ES1 JSR MSV1	:CALL SAVE MODULE	113D-	0E 20 08	3100	MET1 STX DSP	:SHOW PENDULUM
10A9-	A5 E5	1780	LDA *CNTR	:GET TEMPO COUNTER	1140-	A5 E6	3110	COM0 LDA *TRNS	:IS THERE A TRANSPOSE ?
10AC-	D0 05	1790	BNE EOUT	:NO ENTRY-RETURN	1142-	F0 03	3120	BEQ COM1	:NO - BRANCH
10AE-	18	1800	CLC	:PREPARE	1144-	18	3130	TRAN CLC	:YES - PREPARE
10AF-	65 E1	1810	ADC *TPD	:ADD TEMPO VALUE	1145-	69 A4	3140	ADC 0A4	:CALCULATE TRANSPOSE VALUE
10B1-	05 E5	1820	STA *CNTR	:SAVE AS TEMPO COUNTER	1147-	18	3150	COM1 CLC	:MORE PREPARATION
10B3-	60	1830	EOUT RTS	:THEN RETURN	1148-	65 E0	3160	ADC *PBUF	:CALCULATE NOTE
		1840			114A-	80 40 00	3170	COUT STA OUTP	:PLAY NOTE
		1850		:OPTION MENU - RETURNS TO PREVIOUS	114D-	68	3180	PLA	:GET STUS (OPTION CODES)
		1860		:OPERATING MODE AFTER TURNING ON OR	114E-	6A	3190	ROR	:SYNC OPTION ON ?
		1870		:CANCELLING OPTIONS	114F-	90 06	3200	BCC KRED	:NO - SKIP
		1880			1151-	20 49 1E	3210	JSR DBIT	:WAIT FOR CLIK
10B4-	05 E9	1890	TBLM STA *TPNT	:T-SEQ POINTER TO BEG.	1154-	4C 60 11	3220	JMP CTRL	:SKIP READING AGO
10B6-	A5 E2	1900	LDA *STUS	:ASSERT T-SEQ OPTION	1157-	2C 10 00	3230	KRED BIT KBD	:WAIT FOR DUMMY SCAN
10B8-	09 00	1910	ORA 00		115A-	10 FB	3240	BPL KRED	:LOOP UNTIL STARTED
10BA-	D0 0E	1920	BNE MCOM	:BRANCH ALWAYS	115C-	AD 10 00	3250	KR2 LDA KBD	:WAIT FOR SCAN TO START
10BC-	A5 E2	1930	MET LDA *STUS	:TURN METRONOME ON	115F-	30 FB	3260	BMI KR2	:LOOP UNTIL STARTED
10BE-	09 40	1940	ORA 40		1161-	2C 10 00	3270	KR3 BIT KBD	:CHECK FOR KEYS DOWN
10C0-	D0 00	1950	BNE MCOM	:BRANCH ALWAYS	1164-	30 05	3280	BMI KRTN	:WHEN SCAN DONE, RETURN
10C2-	A5 E2	1960	SYNC LDA *STUS	:TURN ON SYNC TO	1166-	50 F9	3290	BVC KR3	:CURRENT KEY NOT DOWN, LOOP
10C4-	09 01	1970	ORA 01	:CLICK TRACK OPTION	1168-	AD 10 00	3300	LDA KBD	:KEY DOWN, GET IT
10C6-	D0 02	1980	BNE MCOM	:BRANCH ALWAYS	1168-	05 EC	3310	KRTN STA *PBUF	:SAVE RESULT
10C8-	A9 00	1990	CNCL LDA 00	:PREPARE AND	116D-	20 00 1F	3320	CTRL JSR DECD	:GET COMMAND
10CA-	05 E2	2000	MCOM STA *STUS	:CANCEL ALL OPTIONS	1170-	00 06	3330	BCS DO	:OLD COMMAND - DO IT
10CC-	4C 0F 12	2010	JMP TCM1	:JUMP FOR THE REST	1172-	B9 00 11	3340	LDA STBL Y	:NEW COMMAND - GET LINK
		2020			1175-	80 7B 11	3350	STA ACTN+01	:PLACE LINK
		2030		:CLICK MODE - SENDS CLICK TRACK TO TAPE	1178-	A9 00	3360	DO LDA 00	:THIS WILL BE HANDY
		2040		:AGO KEYBOARD SCAN RATE IS TIMER	117A-	20 03 00	3370	ACTN JSR DUMY	:CALL OPERATING MODE
		2050			117D-	AD 7B 11	3380	LDA ACTN+01	:SAVE CURRENT COMMAND
10CF-	18	2060	CLIK CLC	:PREPARE TO SEND "0"	1180-	05 E3	3390	STA *LSTL	:LINK FOR LATER
10D0-	20 25 1E	2070	JSR SBIT	:SEND IT	1182-	D0 94	3400	BNE COM	:AND LOOP ALWAYS
10D3-	60	2080	RTS	:RETURN FOR KEYBOARD DELAY			3410		
		2090					3420		:SAVE MODULE - TAKES CARE OF ALTERNATELY
		2100		:METRONOME TEMPO CHANGE - PROGRAM ON PAGE 2			3430		:STACKING DURATIONS AND NOTES IN M-SEQUENCE
		2110					3440		:USES WHAT WILL BE "END OF SEQUENCE"
10D4-	4C 54 12	2120	TCHG JMP TCH	:JUMP TO PROGRAM			3450		:INDICATOR IN PLAY MODES AS POINTER
		2130					3460		
		2140		:DUMP MAT-SEQ TO TAPE - PROGRAM ON PAGE 2	1184-	00 09	3470	MSV1 BCS MS1	:FIRST PASS?
		2150			1186-	00 01 03	3480	STA MTBL+01	:YES-ZERO PROGRAM NOTE
10D7-	4C 20 12	2160	OTAP JMP TOUT	:JUMP TO PROGRAM	1189-	05 E8	3490	STA *MEND	:ZERO M-SEQ POINTER
		2170			118B-	05 E6	3500	STA *TRNS	:ZERO TRANSPOSE
		2180		:LOAD MAT-SEQ FROM TAPE - PROGRAM ON PAGE 2	118D-	05 E8	3510	STA *PBUF	:ZERO OUTPUT NOTE
		2190			118F-	A5 E5	3520	MS1 LDA *CNTR	:GET TIME SINCE LAST NOTE
10DA-	4C 33 12	2200	ITAP JMP TIN	:JUMP TO PROGRAM	1191-	A6 E8	3530	LDA *MEND	:AND M-SEQ END POINTER
		2210			1193-	90 00 03	3540	STA MTBL X	:SAVE THE TIME
		2220			1196-	20 13 10	3550	JSR NRML	:IN CASE NO KEYS DOWN
		2230		:COMMAND LINKS - LOW BYTE OF ADDRESS OF SUBS	1199-	29 7F	3560	AND 7F	:CLEAR D7 IN OUTPUT NOTE
		2240			119B-	D0 01 03	3570	CMP MTBL X	:SAME AS LAST NOTE?
1100-	85 85 85 85 C2 BC B4 C8	2250			119E-	F0 00	3580	BEQ OUT	:YES, LEAVE
1100-	CF D4 00 7C DA D7 0C 0C	2260			11A0-	E8	3590	INX	:NO, SAVE BY INCREMENTING
1110-	45 92 63 46 3F A3 1E 46	2270			11A1-	E8	3600	INX	:M-SEQ POINTER TWICE
		2280			11A2-	06 E8	3610	STX *MEND	:AND SAVING AS END
		2290		:OR 1118	11A4-	90 01 03	3620	STA MTBL X	:THEN SAVE NOTE
		2300			11A7-	A9 00	3630	LDA 00	:AND ZERO TIME SINCE
		2310			11A9-	05 E5	3640	STA *CNTR	:LAST NOTE
		2320		:COMMON PROGRAM - DOES METRONOME WHEN ON	11AB-	60	3650	OUT RTS	:AND RETURN
		2330		:ADDS PLAY AND TRANSPOSE BUFFERS TO GET			3660		
		2340		:OUTPUT NOTE, PLAYS NOTE, READS COMMAND			3670		:PLAY MODULE - MANAGES M-SEQ AND T-SEQ
		2350		:KEYBOARD AND JUMPS TO SELECTED MODE			3680		:POINTERS AS WELL AS TEMPO CLOCK
		2360		:SUBSTITUTES CLICK SYNCH FOR KEYBOARD			3690		:DETERMINES WHEN NOTES ARE TO BE PLAYED
		2370		:TIMING LOOP WHEN SYNC OPTION IS ASSERTED			3700		
		2380			11AC-	00 00	3710	PLA1 BCS CONT	:FIRST PASS ?
1118-	A5 E2	2390	COM LDA *STUS	:CHECK OPTIONS	11AE-	05 E4	3720	STA *TRNS	:YES-ZERO TEMP. TRANSPOSE
111A-	40	2400	PHA	:SAVE A COPY	11B0-	05 E9	3730	LP1 STA *TPNT	:ZERO T-SEQ POINTER
111B-	0A	2410	ASL	:METRONOME ON ?	11B2-	05 EA	3740	LP2 STA *MEND	:AND M-SEQ POINTER
111C-	10 22	2420	BPL COM0	:NO - BRANCH	11B4-	05 E5	3750	STA *CNTR	:AND CLOCK (TEMPO COUNTER)
111E-	C6 DF	2430	DEC *MTRC	:DECREMENT METRONOME COUNTER	11B6-	A5 E5	3760	CONT LDA *CNTR	:GET CLOCK
1120-	10 1E	2440	BPL COM0	:NOT <0 YET, BRANCH	11B8-	A4 E9	3770	LDY *TPNT	:GET T-SEQ POINTER
1122-	A6 E1	2450	LDX *TPD	:TIME UP, GET TEMPO VALUE	11BA-	A6 EA	3780	LDX *MEND	:GET M-SEQ POINTER
1124-	CA	2460	DEX	:DECREMENT ONCE	11BC-	D0 02 03	3790	CMP MTBL2 X	:TIME UP?
1125-	06 DF	2470	STX *MTRC	:THEN SAVE AS COUNTER					

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11BF- 90 15 3800 BCC PL1 :NO, BRANCH
11C1- A9 00 3810 LDA 00 :YES, PREP. COUNTER, ETC.
11C3- 85 E5 3820 STA *CNTR :FOR NEXT ACCUMULATION
11C5- E8 3830 INX :INCREMENT M-SEQ POINTER
11C6- E8 3840 INX :TWICE
11C7- 86 EA 3850 STX *MPNT :AND SAVE NEW POINTER
11C9- E4 E8 3860 CPX *MEND :END OF M-SEQ?
11CB- D0 09 3870 BNE PL1 :NO - BRANCH
11CD- C8 3880 INY :YES, INC T-SEQ POINTER
11CE- C4 E7 3890 CPY *TEND :END OF T-SEQ ?
11D0- 00 DE 3900 BCS LP1 :YES-START T&M-SEQ AGAIN
11D2- 84 E9 3910 STY *TPNT :NO-SAVE T-SEQ POINTER
11D4- D0 DC 3920 BNE LP2 :BRANCH-START M-SEQ AGAIN
11D6- 80 03 03 3930 PL1 LDA MTB3,X :GET THE NOTE
11D9- 85 E8 3940 STA *PBUF :SAVE IN PLAY BUFFER
11DB- 89 C0 02 3950 LDA TBL,Y :GET TRANSPOSE
11DE- 85 E6 3960 STA *TRANS :TO TRANSPOSE BUFFER
11E0- 60 3970 RTS :RETURN
3980 :
3990 :TAPE TRANSFER PARAMETER TABLE
4000 :
4010 TAPE .HS FF00FF03C002C002
4020 :
4030 :OR 1200
4040 :
4050 :COMMON PORTION OF TEMPO UP & DOWN -
4060 :ROTATES RIGHT OR LEFT THE DURATIONS
4070 :SAVED WITH M-SEQUENCE
4080 :
1200- 80 06 12 4090 TCOM STA PLAC :PLACE ROR OR ROL OP CODE
1203- A2 00 4100 LDX 00 :ZERO A COUNTER/POINTER
1205- 18 4110 TLP CLC :PREPARE
1206- 7E 02 03 4120 PLAC ROR MTB2,X :ROTATE SAVED TEMPO
1209- E8 4130 INX :INCREMENT POINTER TWICE
120A- E8 4140 INX :TO POINT TO NEXT
120B- E4 E8 4150 CPX *MEND :END OF M-SEQ ?
120D- D0 F6 4160 BNE TLP :NO - LOOP FOR MORE
120F- A5 E3 4170 TCM1 LDA *LSTL :DONE, GET LINK AND
1211- 80 7B 11 4180 STA ACTN+01 :SET UP FOR PREVIOUS MODE
1214- 60 4190 RTS :THEN RETURN
4200 :
4210 :SET UP PROCEDURE FOR TAPE TRANSFER
4220 :
1215- A2 07 4230 STTP LDX 07 :TRANSFER 7 BYTES
1217- 80 E1 11 4240 STP LDA TAPE,X :GET PARAMETER FROM TABLE
121A- 95 F0 4250 STA *BUFF,X :PLACE IN POT-SHOT BUFFER
121C- CA 4260 DEX :POINT TO NEXT, MORE ?
121D- D0 F8 4270 BNE STP :YES - LOOP
121F- 60 4280 RTS :NO - RETURN
4290 :
4300 :DUMP M-SEQ AND T-SEQ TO TAPE
4310 :
1220- 20 15 12 4320 TOUT JSR STTP :SET UP FOR TRANSFER
1223- A5 E8 4330 LDA *MEND :SAVE M-SEQ END WITH
1225- 80 00 03 4340 STA MTBL :M&T-SEQUENCE
1228- A5 E7 4350 LDA *TEND :ALSO T-SEQUENCE END
122A- 80 01 03 4360 STA MTB1 :
122D- A9 D0 4370 LDA 00D :SET UP FOR DUMP
122F- 20 46 12 4380 JSR DOTP :AND DO IT
1232- 60 4390 RTS :THEN RETURN
4400 :
4410 :LOAD M-SEQ AND T-SEQ FROM TAPE
4420 :
1233- 20 15 12 4430 TIN JSR STTP :SET UP FOR TRANSFER
1236- A9 11 4440 LDA 11 :SET UP FOR LOAD
1238- 20 46 12 4450 JSR DOTP :AND DO IT
123B- A0 00 03 4460 LDA MTBL :PLACE M-SEQUENCE END
123E- 85 E8 4470 STA *MEND :
1240- A0 01 03 4480 LDA MTB1 :AND T-SEQUENCE END
1243- 85 E7 4490 STA *TEND :
1245- 60 4500 RTS :THEN RETURN
4510 :
4520 :PERFORM TAPE TRANSFER
4530 :
1246- 20 A9 1E 4540 DOTP JSR CASS :CALL POT-SHOT
1249- A0 0F 11 4550 LDA STBL+0F :SET UP TO RETURN
124C- 80 7B 11 4560 STA ACTN+01 :IN NORMAL MODE
124F- 18 4570 CLC :PREPARE
1250- 20 22 1F 4580 JSR BEEP :SIGNAL DONE
1253- 60 4590 RTS :AND RETURN
4600 :
4610 :CHANGE METRONOME TEMPO

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4620 :
1254- 85 DF 4630 TCH STA *MTRC :ZERO METRONOME CLOCK
1256- 66 E1 4640 ROR *TPO :HALVE TEMPO VALUE
1258- 90 02 4650 BCC TCHR :IF NOT ZERO, LEAVE
125A- 66 E1 4660 ROR *TPO :ZERO, MAKE NOT ZERO
125C- D0 B1 4670 TCHR BNE TCM1 :GO SET UP PREVIOUS MODE
4680 :
4690 END .EN
4700 :

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