ADVANCED MUSICSYSTEM

PERSONAL DEVELOPMENT

A comprehensive music composition tool

For ages 11 and up

CONSUMER-WRITTEN PROGRAMS FOR

ATARI®

HOME COMPUTERS

APX

ATARI Program Exchange

ADVANCED MUSICSYSTEM

by
Lee Actor

Program and Manual Contents © 1982 Lee Actor

Distributed By

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Contents

Overview

The ADVANCED MUSICSYSTEM is a set of programs that take full advantage of the ATARI Home Computer System's sound-producing hardware. It's aimed at, though not limited to, those familiar with music notation and basic musical terms.

The program lets you enter musical notes from the computer keyboard. You specify octave, dynamic level, meter, key, and tempo. A special feature automatically duplicates recurring note patterns. If desired, you can define the tempo as a metronome marking over a wide range of values. ADVANCED MUSICSYSTEM has special commands to aid in using different degrees of musical articulation. Every time you enter a note, the program reproduces it through the television speaker and displays it on the screen, where you can modify it if necessary. The program plays as many as four independent voices in a 5 1/2 octave range.

With ADVANCED MUSICSYSTEM you can save music on a diskette and merge files to create very large files. Built-in synchronization lets you play at least eight simultaneous voices using an external tape recorder. Entire diskettes of music files play automatically by using the auto-play program.

ADVANCED MUSICSYSTEM plays very complex rhythms and extremely rapid tempos (more than 2400 notes per second). By using the ATARI Paddle Controllers you can adjust the tempo while listening to a piece of music. Five demonstration pieces are included with the program.

Required accessories

- ATARI BASIC Language Cartridge
- 32K RAM
- ATARI 810 Disk Drive
- Additional DOS II-formatted diskettes for storing music

Optional accessories

- Stereo cable
- A set of ATARI Paddle Controllers

Contacting the author

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Getting started

Loading ADVANCED MUSICSYSTEM into computer memory

1. Insert the ATARI BASIC Language Cartridge in the cartridge slot of your computer.

2. Have your computer turned OFF.

3. Turn on your disk drive.

4. When the BUSY light goes out, open the disk drive door and insert the ADVANCED MUSICSYSTEM diskette with the label in the lower right-hand corner nearest to you. (Use disk drive one if you have more than one drive.)

5. Turn on your computer and your TV set. The program will load into computer memory and start automatically.

The first display screen

The following messages display as the program loads into memory:

<div align="center">

Loading
ADVANCED
MUSICSYSTEM

</div>

and:

<div align="center">

One moment, please

</div>

Then the main menu displays the eleven primary options available in the ADVANCED MUSICSYSTEM. Each item is preceded by a single letter.

Using Advanced Musicsystem

Introduction

The main menu looks like this:

```
A.   PLAY
B.   ENTER/EDIT MUSIC
C.   ERASE
D.   PLAY MEASURE(S)
E.   SAVE
F.   LOAD
G.   DISK DIRECTORY
H.   TEMPO (100)
I.   FORMAT DISK
J.   AUXILIARY PROGRAM
K.   AUTO-PLAY PROGRAM


Select item
```
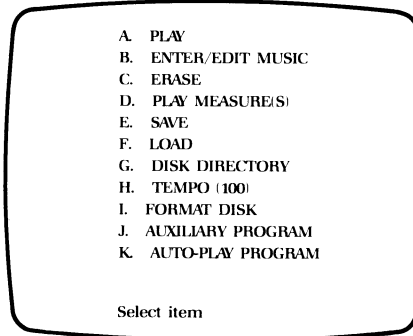
Figure 1 Main Menu

The menu is accessible from any section of the program. To select an item from the menu, type the corresponding letter. Throughout the program you enter information one of two ways: single characters only (e.g., menu selections and certain prompts), and one or more characters followed by pressing the RETURN key. Your typed characters appear in a solid box after you enter information and press the RETURN key. None of the usual editing keys may be used except DELETE BACK S.

ADVANCED MUSICSYSTEM provides extensive protection against errors. Potentially destructive keys like the BREAK, CAPS LOWER, and the ATARI inverse video keys have been disabled. You can't get "stuck" in a section of program. The usual escape is to press the RETURN key. With all error messages you hear a bell and see a clear indication of what's wrong. Pressing the SYSTEM RESET key causes the loss of all data and the program restarts.

Option A - Play

Use this option to listen to a piece that is in memory. The following menu appears asking you to select a combination of voices:

```
               WHICH VOICES ?

        A. ALL              I. 2,3
        B. 1,2,3            J. 2,4
        C. 1,2,4            K. 3,4
        D. 1,3,4            L. 1
        E. 2,3,4            M. 2
        F. 1,2             N. 3
        G. 1,3             O. 4
        H. 1,4


                  Select one
```
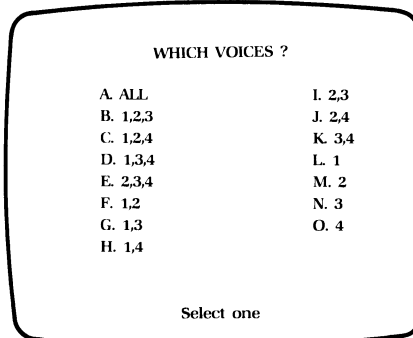
Figure 2 Option A submenu

Press the corresponding letters to make your choice. The selected voices play, stopping when the lowest-numbered voice finishes. It's good practice to make all voices the same length by filling them with the correct number of rests at the end. If you have voices of varying length, the program will blindly go on interpreting memory. This memory could either be the next voice or nonsense. You'll have the correct effect if one or more voices is completely empty.

While a piece plays, a piano keyboard appears on the screen. The keys you're hearing turn four different colors, representing each voice that's playing.

Varying the tempo. You can vary the tempo using a pair of ATARI Paddle Controllers. Plug the controllers into the first (leftmost) controller jack at the front of your console. Turn the paddles clockwise to speed up the tempo and counterclockwise to slow it down and then press the trigger buttons on the controllers. The right Paddle Controller handles large increments of speed. The left one controls fine increments.

To interrupt the playing of a piece, press the START, SELECT, or OPTION key and you'll return to the main menu.

Option B - Enter/Edit Music

At first the Enter/Edit option may seem complicated. With a little practice, however, the logic will become clear.

If you select option B and already have some music in memory, the prompt

<div align="center">Voice #? (1-4)</div>

displays. After responding, you'll automatically be in the measure after the last measure of the already entered voice. If memory is clear, you'll be in the first measure of voice one. The display for the Enter/Edit Music option looks like this:

```
        VOICE 1        MEASURE 1      BEATS=0
    →                                 METER=4/4
                                      TEMPO=100
                                         SCALE ON
                                         KEY=0#
                                         OCT=4
                                         DUR=Q
                                         DYN=mf
                                         MEM=3401

       Note [Oct][Dur[Tie]][/Dot][/Dyn]?
       ┌─────────────────────────────────┐
       └─────────────────────────────────┘
```
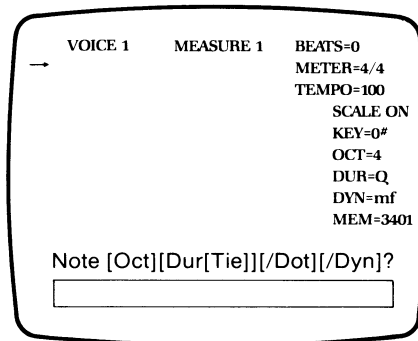
Figure 3 Option B display

The display for Enter/Edit Music shows
  (1) current voice and measure (e.g., VOICE 1 and MEASURE 1)
  (2) the number of beats in the present measure (e.g., BEATS=0)
  (3) the current meter and tempo (e.g., METER=4/4 and TEMPO=100)
  (4) the SCALE option status (e.g., SCALE ON)
  (5) the key signature in sharps and flats (e.g., KEY=0#)
  (6) the current default values for octave number, duration, and dynamic (e.g., Oct=4, Dur=Q, and Dyn=mf)
  (7) the amount of memory left for entering notes (e.g., MEM=3401) and

(8) a prompt at the bottom of the screen to remind you of the entry format (e.g., Note [Oct][Dur[Tie]][/Dot][/Dyn]?)

The center of the screen displays notes and contains a movable cursor. You use commands to perform all the activities.

ADVANCED MUSICSYSTEM contains a series of operations within the Enter/Edit Music option. These operations are

> Entering notes
> Editing notes
> Scale option
> Go to measure
> Insert measure
> Change meter
> Change key signature
> Repeat notes
> Play current measure
> Quit

These options are described below.

Entering Notes

Each time you enter a note, it sounds through the television speaker and displays on the screen. The cursor moves to the next position automatically. You can move the cursor by pressing the CTRL key and the up arrow or down arrow key. When the cursor reaches the bottom of the screen, it repositions itself to begin a second column of notes. When you reach the bottom of the second column, the cursor "wraps around" to the starting point. The entered notes stay in memory giving you room to display new notes.

The format for entering notes consists of

> Note [Oct][Dur[Tie]][/Dot][/Dyn]

All items in brackets are optional. If you don't specify values for Oct, Dur, or /Dyn, the program assigns the default values displayed on the right side of the screen. The format for a "rest" is R[Dur]. As you key in information, it displays in the window below the commands.

Note

Type the name of a note using the letters A to G, optionally followed by an accidental (# - sharp, F - flat, or N - natural). You don't have to enter accidentals if they're in the key signature. If you do use an accidental, it carries through until the end of the measure, or until you specify a new accidental (e.g., A# remains until you enter AN). You can't directly enter double sharps or flats. However, you can easily use equivalent pitches. For example, Dbb (double flat) is written CN or B#.

Oct

Indicate the octave with a number between 1 and 6. "Oct" begins with the note C and ends with B. C4 is middle C. The lowest note is C1 (three octaves below middle C, the lowest C on the piano). The highest note is F6 (two and one-half octaves above middle

C). Through half-speed recording, the upper range can be extended to F7. For a complete explanation of this recording feature, please refer to the section entitled, *Record and record with timing marks*. If you don't choose to use the octave option, the program uses the octave of the last entered note.

Dur

Specify the basic duration of an individual note by using the letters:

W = whole note
H = half note
Q = quarter note
E = eighth note
S = sixteenth note
T = thirty-second note

You can modify the basic duration with one of several options. The simplest is either a dot (.) or a double dot (..). The dot increases the note's value by one-half. The double dot increases the value by three-fourths. For example, a double-dotted quarter note, Q.. , is as long as a quarter note plus an eighth note and a sixteenth note. If you enter more complex rhythms, follow the basic duration letter with any whole number up to 64. If you're familiar with music, this notation represents the figure found above a bracketed series of notes, such as

In the first example, the duration of each of the eighth note triplets is E3. In the second example, each of the sixteenth notes septuplets has a duration of S7.

Note. Three triplets take the same amount of time as two regular notes. Five quintuplets or seven septuplets take the same amount of time as four regular notes. The *notational rule* is: n-tuplets take the same time as m regular notes, where m is the greatest power of two (i.e., 2,4, 8,16,...) less than or equal to n.

The most general duration option has the form "Dn:m". "D" is one of the basic duration letters, "n" is an integer between 1 and 64 inclusive, and "m" is between 1 and 99 inclusive. This extension to the previous duration option has the meaning of "n notes in the time of m", or a note length of m/n times the basic duration letter. For example, a quarter note triplet, Q3, is equivalent to Q3:2. A dotted half note, H. , is the same as H2:3 (i.e., two of these notes take the same time as three half notes). You can write a sixteenth note as E2:1, Q4:1, H8:1, and so on. A whole note is equivalent to T1:32 . Use this duration option for entering

(1) "uneven" durations (e.g., each note in a 3/4 measure containing 11 notes has a duration of Q11:3)

(2) extremely short notes (as short as 1/30 of a thirty-second note or T30:1)

(3) extremely long notes

The ADVANCED MUSICSYSTEM has two additional duration options:

(1) T64 = a sixty-fourth note. It is the same as T2:1.

(2) The single letter M denotes the duration of an entire measure. This is valid

when the METER function is on. In addition, a note with the M duration automatically moves you to the next measure.

Tie

Use the letter T to tie notes together. Normally, ADVANCED MUSICSYSTEM inserts a short rest between two notes with the same pitch. The tie option causes the two notes to sound like one continuous note. This option prevents the insertion of the rest and removes it during editing.

A tie between two notes with different pitches, or the same pitch in different octaves, has no effect. If the last note in a measure has an accidental (sharp or flat) and is tied, the accidental carries through the next measure.

Note. Although the duration is normally optional, use of the tie requires a duration to be specified. By itself, T indicates a thirty-second note.

/Dot

You have two special commands for entering articulated or separated notes, sometimes indicated by a dot directly above or below a note.

(1) /D is the command that reduces a note's duration to 3/4 its entered duration. Automatically, a rest of 1/4 the note's original length is entered.

(2) /DD is the command that reduces a note's duration to 1/4 its entered duration and inserts a rest of 3/4 the original length.

Since ADVANCED MUSICSYSTEM plays regularly entered notes smoothly (legato), these commands will be useful when entering a series of short notes. You don't enter the rests individually. For complex rhythms, you don't have to calculate the duration of notes and rests. Just enter the total duration for the note followed by /D or /DD . For a note length between /D and /DD, enter the note using half of the original duration (for example: enter E.. as S.. , and E3 as S3). Then follow the notation with R . You'll find this a very fast method for entering a series of notes with the same duration since you enter the duration only for the first note.

/Dyn

ADVANCED MUSICSYSTEM has fifteen different dynamic levels available for each note. These are, from softest to loudest,

/PPP, /PP, /P /MP, /MF, /F, /FF, /FFF, /F1, /F2, /F3, /F4, /F5, /F6, /F7

Generally, you'll use the lower eight dynamics. Use /F1 through /F7 for various levels of accents. Never have all four voices at FFF or higher. Doing so causes distortion.

Note. You can put a crescendo or diminuendo on a single note by dividing the note into a number of small units tied together. Each unit will have a different dynamic marking.

The only piece of information you need for the entry of each note is its name. If you omit the octave, duration, or dynamic marking you'll retain the most recently entered values. Use T (tie), /D, and /DD only as needed. Upon loading the program or after erasing all voices, the default values are octave=4, duration=quarter note, and dynamic=mf. The following figure illustrates the keystrokes necessary to enter notes. Assume you press the RETURN key at the end of every line.

(1) lowest and highest notes: C1 and F6
(2) C4H (middle C)
(3) G#2Q..
(4) RE.
F4T3
E
D
(5) BF4S/FF
R
C5ET/P
CW
(6) BN4E5/D/F (or /DD for very short notes)
G5/D
DF4/D/F3 (or /FFF, /F6, etc.)
C2/D/F
E3/D

Editing Notes

A measure holds as many as 255 notes. The display screen represents a "window", 34 notes wide. You move the cursor anywhere within the measure by pressing the CTRL key and up or down arrow key. You can't move the cursor ahead of the first note or more than one position beyond the last note in the displayed measure. ADVANCED MUSICSYSTEM provides several methods for editing already entered notes.

(1) Change a note by positioning the cursor at the note and enter a new one. The new note writes over the old one.

(2) Delete a note by positioning the cursor and pressing the CTRL and DELETE keys. The note disappears and all notes following the cursor move up one position to fill the empty space.

(3) Insert a note by positioning the cursor and pressing the CTRL and INSERT keys. All notes starting at the cursor will move down one position and an asterisk (*) appears at the cursor position. Now you can either enter a new note, insert more notes, or move the cursor. When you leave a measure, the program automatically removes all asterisks.

(4) Delete all the notes in a measure by pressing the CTRL and CLEAR keys. The program erases the notes and repositions the cursor at the beginning of the measure. If the measure is empty when you exit, all succeeding measures move down by one. This, in effect, deletes that measure.

Scale Option

This option turns on and off when you type SCA . The screen displays the on or off status in the upper right corner. If you do not specify the octave, the Scale Option affects the interpretation of the octave. When Scale is OFF, the program uses the octave number of the previously entered note (e.g., after C4, B is interpreted as B4, a major seventh above). When the Scale Option is ON, the octave number of the note nearest the previous note is used (e.g., after C4, B is interpreted as B3, a semitone below). The nearest note will be within a perfect fourth of the previous note. A G following a C is interpreted as the G below the C. A note forming the interval of an augmented fourth or diminished fifth with the previous note appears in the same octave with SCALE OFF, and in a different octave with SCALE ON.

Having SCALE ON is useful when entering notes within small intervals. Since it's always possible to specify the octave, if necessary, you can enter scales of any range without taking notice of octave number changes. It's anticipated that you'll use the initial default value, SCALE ON, most of the time.

While editing, the short rest separating two untied notes is not displayed on the screen. ADVANCED MUSICSYSTEM keeps track of the ties internally and inserts or deletes them with the accompanying notes as necessary. Although ties don't reside in computer memory, tied notes may be edited. For example, if you change the pitch of a tied note and then later change it back to the original pitch, the tie is lost and a very short rest is inserted. You can always respecify the tie.

Go to Measure

When you finish entering notes for the current measure, type M to go to the next measure, or Mx to go to measure number x (x is a positive integer). If you try to go past the last measure, you'll be put in the measure just after the last measure. You won't be allowed to leave the measure using these commands if the number of beats is incorrect and METER is not turned off. You can read about METER in the section entitled *Change Meter.*

When you go to a previously entered measure, the notes display one by one and the cursor positions at the end of the measure. Since the program does not store the actual keystrokes used to enter the notes, the notes must be decoded directly from memory. The notes may display differently than you entered them. For example, the octave, duration, and dynamic appear whether or not you entered them. The letter b appears for a flat instead of F . The dynamic converts to lower case and /D and /DD don't appear. Sometimes, depending on the key signature, a note is interpreted as its enharmonic equivalent (e.g., G# for Ab). The most noticeable discrepancies will be in the decoding of durations. You'll see:

(1) The simplest possible interpretation of the duration. For example, S3 appears instead of S6 and Q.. appears instead of Q4:7 .

(2) Notes longer than W.. decode as W++ .

(3) Notes adjusted for meter synchronization appear with a + following the duration. This is explained in the *Change Meter* section.

(4) Durations that can't be reduced to a power of two ratio appear as the next higher basic duration letter followed by ? . For example, Q7:5 decodes as Q? and Q5:7 decodes as H? .

This compromise avoids the time-consuming task of decoding the more than 32,000 possible durations. Remember, only the display of the note is different. The note itself is still in memory just as you defined it. Also, the exact number of beats for the note always displays correctly.

Insert Measure

To insert a measure just before the current measure, type the command INM . All the measures beginning with the current measure move over one to make room for the new measure. An empty measure now appears. This command has no effect if the present measure is empty.

Change Meter

To change the meter, type the command MET . You'll see the prompt

METER (x/y):

Now either enter any two numbers totaling six characters or less separated by / or type OFF . If you change your mind, press the RETURN key. The first number indicates the number of beats in a measure. The second number indicates which note gets a beat. The current number of beats in the measure displays directly above the meter. You can enter fractional meters such as 2.5/4 , or even 5/3 (one-third of a whole note gets a beat). The initial default value is 4/4 . If your entry is valid it appears near the word METER on the upper right part of the screen.

If the meter is not turned off, it aids in ensuring that the correct number of beats appears in the measure. If you make an attempt to enter a note that causes the number of beats to be too large or you attempt to go to another measure when you have too few beats, the program:

    (1) ignores your command,
    (2) rings a bell,
    (3) and highlights the word METER on the upper right portion of the screen

However, ADVANCED MUSICSYSTEM doesn't check the number of beats in the current measure when you're inserting a measure, repeating measures, or quitting. The meter has no effect on playback. It is an input aid only.

If the meter is on, the program automatically performs measure synchronization. ADVANCED MUSICSYSTEM can't precisely express certain complex rhythms. Although you've entered notes properly, the number of beats in a measure may be a fraction too low. When you exit from the measure, the program will, if possible, apply a fractional correction to the number of notes necessary to synchronize the measure precisely.

To illustrate this feature set the meter to 4/4 and enter seven different notes with the duration Q7 . Notice that the number of beats in the measure is 3.996 instead of 4. Now use the Mx command with x being the number of the current measure. The duration of the first note displays as Q7+ and the total number of beats in the measure is exactly 4. This first note is only 0.7 percent longer than the rest and undetectable during playback.

Change key signature

Use the command KEY and you see the prompt

$$KEY(x^\# \text{ or } xF)$$

Type a number from 0 to 7 followed by # or F . The new key signature displays on the right side of the screen after KEY= . For example, using a key signature of 3# means that you don't have to type the # when entering F#, C#, or G# (automatic sharps in this key).

Sharps and flats may always be explicitly specified. Changing the key signature in the middle of a measure resets all sharps and flats.

Note. The key signature has an effect only on the way you enter notes. Changing the key signature after notes have been entered causes them to display differently. However, this does not change the notes in memory. The initial default value for the key signature is 0# .

Repeat notes

Several commands save you the trouble of entering a sequence of notes more than once. These commands have the forms of:

REPx, REPx,y, REPM, REPMx, REPMx,y

Using REPx or REPx,y causes a pattern of notes within a single measure to repeat. REPx means repeat the last x notes. REPx,y means repeat the last x notes y times (x and y are positive integers). When you use this command, the repeated notes display one by one. You must have the cursor at the end of the measure. Notes from previous measures won't transfer to the present measure. This function repeats up to 128 notes.

REPM , REPMx , and REPMx,y duplicate whole measures in memory. REPM means "repeat the current measure." If the current measure is empty, this command means "repeat the previous measure." REPMx means "repeat measure x." REPMx,y means "repeat measure x through measure y." Letters x and y are numbers no greater than those of the current measure. You can have the cursor anywhere in the current measure. The program inserts the repeated measures after the current measure, or in the current measure, if it is empty. If the current measure isn't the final measure, the succeeding measures move over to make room for the repeated measures. Then the program automatically enters and displays the repeated notes and measures.

Note. These commands help in duplicating whole sections of music. However, if you're duplicating a large section of music with more than one voice, it is faster to use SAVE and MERGE. These operations are discussed under the section headings, *Save* and *Merge*.

Play current measure

You can hear the entire current measure at any time in tempo by typing the command P . Using this command affects none of the existing information already entered.

Quit

To return at any time to the main menu from the Enter/Edit Music option, type the command Q .

A quick reference guide for all of the available operations in the Enter/Edit Music option is located at the end of this manual. You may find it useful while putting the ADVANCED MUSICSYSTEM to use.

Option C - Erase

Use Option C when entering a new piece and you already have music in memory. After pressing the C key the prompt

Type Y to erase all voices

displays. Press any other key to leave this option. It isn't necessary to use Erase before loading a new piece or at the beginning of a session.

Option D - Play Measure(s)

This option is useful for testing sections of music and finding errors. When you select Option D the prompt

Measure(s) [x or x,y]:

displays. Type a single number to play measure x, or two numbers separated by a comma to play the measures beginning with x and ending with y. The selected combination of voices will now play.

Option E - Save

Use this selection to save the music in memory onto a diskette. In response to the prompt

SAVE FILE NAME:

type your file name according to the standard Disk Operating System rules. (Refer to pages 19 and 20 of the *ATARI Disk Operating System II Reference Manual*.) The piece records on the diskette in drive #1. When the process ends, the main menu displays.

Note. You must use diskettes formatted using DOS II. For more information refer to the section entitled *Format Disk*.

Option F - Load

Option F loads a file into memory from a diskette. In response to the prompt

LOAD FILE NAME:

type the name of the file. You may use wildcards. (Refer to page 21 of the *ATARI Disk Operating System II Reference Manual*.) The file loads from disk drive #1, automatically erasing any music previously in memory.

Option G - Disk Directory

Use this selection to display a directory of all the files on the diskette in drive #1. The screen displays the amount of free space on the diskette followed by the prompt

LOCK, UNLOCK, or DELETE files?

Press the letter L , U , or D to choose one of these funtions. The program asks for a filename. Again, you can use wildcards. Once the function is executed, the directory appears. Press the RETURN key to see the main menu.

Option H - Tempo

The tempo determines the speed of a piece. You can change the tempo before, during, or after a piece is entered. Changing tempo is also possible after you've saved a piece or while it's playing.

You specify the tempo by entering a number from the keyboard. The number is equal to the number of quarter note beats per minute. This number is the metronome marking for a quarter note. If the quarter note is not the basic unit of measurement, you must convert the tempo. For example, in a 6/8 piece with a metronomic indication ♩. = 80, convert it to the mathematical (not musical) equivalent of ♩ = 120.

The tempo displayed in the main menu may be slightly different than the number you enter. This is particularly true for the fastest tempos. Once you enter a new tempo, it displays in the main menu until you change it.

If you use the Paddle Controllers to change the tempo while a piece is playing, the chosen tempo will appear in the main menu. Remember to turn the paddles clockwise to speed up the tempo and counterclockwise to slow it down. The right paddle controls large amounts of speed and the left controls small amounts. The paddles operate only if you press the trigger button. When you use the paddles to change the tempo while a piece is playing, the new tempo displays in the main menu. This is useful for setting a tempo since you hear the effect as you alter it. The program "remembers" the final number.

Option I - Format Disk

ADVANCED MUSICSYSTEM requires that you use formatted diskettes for storing music files. Use this option to format a diskette in your first disk drive. You'll be using DOS II formatting. After pressing the I key you see the prompt

Type Y to format disk

If you need to format your diskette, press Y . Any other key returns you to the main menu. Formatting a diskette removes any information on it. Use this option with caution. (Refer to pages 9-11 and 36 in the *ATARI Disk Operating System II Reference Manual*.)

Option J - Auxiliary Program

The auxiliary program is a scaled-down version of the main program, lacking the

features for entering notes. Using the auxiliary program provides extra memory space. Press the J key and you see

Type Y to run aux. prog.

Make sure you have the ADVANCED MUSICSYSTEM diskette in disk drive #1 before responding to this prompt. If you type Y , the auxiliary program loads, erasing any music in memory, and the following menu displays:

A. PLAY
B. RECORD
C. RECORD w/TIMING MARKS
D. PLAY MEASURE(S)
E. SAVE
F. LOAD
G. DISK DIRECTORY
H. TEMPO (100)
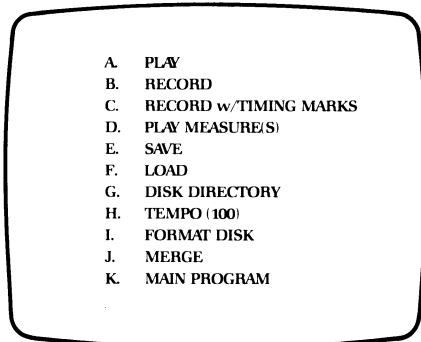I. FORMAT DISK
J. MERGE
K. MAIN PROGRAM

Figure 4 Auxiliary Program Menu

Choose a menu option by pressing the corresponding letter. All of the auxiliary options operate just like their counterparts in the main menu except for RECORD, RECORD w/TIMING MARKS, and MERGE.

Record and Record w/Timing Marks

You can play more than four voices simultaneously using these two recording functions and an external tape recorder (not an ATARI 410 Program Recorder). This feature allows you to record the first set of voices preceded by timing marks. These appear as five equidistant blips followed by a period of silence. You time the next set of voices by using the blips. In this way, all eight voices can play in perfect synchronization.

You can record the second set of voices, as well as the third and fourth, if you have a four-channel tape deck with the capability of monitoring at the record head. This is know as "multi-sync" or "simul-sync". You can record even more than 16 voices by periodically mixing down two or three tracks into one.

If your tape deck has sound-on-sound, you can do limited recording of eight or more voices. If you don't have sound-on-sound, one set of voices plays back through your tape recorder or stereo system while the computer plays another set through the television speaker.

You'll obtain the best sound results by connecting the computer directly to your stereo or to the "line" input of your tape deck. (Read more about this feature in the section entitled *Connecting the computer to your stereo system.*) It's also possible to use a separate microphone or portable cassette recorder to record the sound coming directly from the television speaker.

To record the first set of voices, or track, select Option C - RECORD w/TIMING MARKS. Make sure you have your music to be recorded in computer memory. Make your menu choice and select the appropriate voices. A display entitled "REC. W/ TIMING MARKS" appears along with general information on recording. Turn on your tape recorder making sure it is in the RECORD mode. Press the space bar on the computer and you'll hear five quick beeps and several seconds of silence before the

piece begins. When the piece is over, rewind the recorder to the original starting position.

Bring the second set of voices into memory by either loading the saved voices from your diskette or entering the voices from the computer keyboard. If you choose the latter, erase the music already in memory. Select Option B-RECORD and indicate which voices are to be played. A display entitled RECORD appears with instructions for recording. If you don't have a multi-sync or sound-on-sound tape deck, you won't record the second set of voices; rather you'll only play them.

Note. For sound-on-sound, one channel is played back, mixed with an input, and recorded on the second channel. However, because the first channel isn't played back at the record head, it isn't in sync with the second channel. It's about an inch "behind" it on the tape.

Turn on the tape recorder to play back the first set of voices and, if appropriate, to record the second set. Press the space bar at the exact moment you hear the fifth timing mark. The computer will emit a single beep. If it's not nearly simultaneous with the recorded timing mark, press the START key to interrupt the computer, rewind the tape, and try again. If successful, all eight voices sound in sync. Repeat this process to record additional sets of voices.

If your tape recorder has two speeds, you have the option of recording at half speed. This allows you to shift the effective range of the ADVANCED MUSICSYSTEM one octave higher. Set your recorder at the slower of the two speeds. When the RECORD or REC. W/TIMING MARKS display appears, press 2 before turning on the recorder. If you select timing marks, they will be spread apart twice as far as normal. The silence is twice as long as normal whether you use the timing marks or not. When you play this new recording at the faster speed it will be synchronized with other voices played at the normal speed. You can record sets of voices in any order of half and normal speeds.

Note. Voices recorded at half speed play back an octave higher and twice as fast. You must, therefore, use durations twice as long as normal and pitches an octave lower than notated.

Special Offer

As a demonstration of these recording techniques, a high quality stereo cassette recording is being offered by the author. The recording exhibits the potential power of the ADVANCED MUSICSYSTEM. It contains the entire first movement of Rachmaninoff's Piano Concerto #2 in c minor, recorded in 16 voices and consisting of 16,000 notes. To obtain a copy, send your name and address and $3.50 to the author.

This offer is available only through the author and is completely independent of APX.

Merge

This option lets you create music files that are too large to fit in computer memory when using the main program. Type the letter J with music already in memory and you see the prompt

MERGE FILE NAME:

MERGE works in the same way as the LOAD operation except it won't erase music already in memory. Each voice on the diskette file attaches to the end of the appropriate voice in memory. The program renumbers the measures from the merged file to follow in sequence.

Use MERGE to create a long piece of music by first entering and saving it in sections. Then merge the sections and save the results as one large file. The main program won't be able to load this file. You'll want to be sure each section is correct before merging.

Another use for MERGE is for repetition of whole sections of music. Enter and save the section to be repeated. Then start entering the rest of the piece. When you come to the place where the repeated section should be, save what you've entered, run the auxiliary program, load the main part of the piece, and merge in the repeated section. Since the original file remains unchanged, you can merge a file as often as necessary.

Option K - Auto-Play Program

Use this option to load all the files on a diskette into computer memory and play them in the order they appear on your diskette. After you select this main menu option, the prompt

Type Y to run auto-pl. prog.

displays. Insert the ADVANCED MUSICSYSTEM diskette into disk drive #1 and type Y. The Auto-Play program loads and the prompt

Insert disk and press RETURN

appears. Remove the ADVANCED MUSICSYSTEM diskette and put your diskette with the desired music in disk drive #1 and press the RETURN key. Music files now load into computer memory and play in order. Each file name displays as it loads. The computer automatically skips over non-music files. When all the pieces have played, the process repeats continuously.

You can interrupt any piece by pressing the START, SELECT, or OPTION keys. Pressing the START key also interrupts the automatic playing. Then you can insert another disk. To return to the main program, insert the ADVANCED MUSICSYSTEM diskette and press the SYSTEM RESET key.

Use the Auto-Play program to hear the demonstration pieces included with the ADVANCED MUSICSYSTEM, or design your own albums using Auto-Play as your "record player".

Sample session

This session takes you through entering, playing, and saving a short excerpt from Haydn's Op. 74#1 string quartet. As you enter the notes, follow the score reproduced on the next page to see how printed music translates into typed commands.

(1) Press H to select the tempo option from the main menu.

(2) Then type 140 (as an educated guess for the tempo) and press the RETURN key. You now see the main menu again.

(3) Press B to select the Enter/Edit Music option. You will be placed automatically in measure one of voice one.

(4) Start entering the music for the first violin part, as shown below. If you make a mistake, use your editing keys. The notes for each measure appear on a single line with comments in parentheses. A blank space separates individual commands from one another. Complete each command by pressing the RETURN key.

MET
6/4 (to simulate the fermatas in the first two measures)

B4M/FF (extending dynamics by one degree for greater contrast)

CQ R RW M

MET
4/4

CH/PP D M

B CQ C#/P M

DH EFQ/MP EN M

G/MF GT/F F REP2,2 E F EQ RE G/D/FF M

C/D ES DT R C R B R A R G R F R E R D R C R B R A R G R F R M

EH DQ A4/FFF M

C4H/FF BE/D C/DD D/DD E/DD M

GQ GT F REP2,2 E F EE RQ. M (short last note to match cello)

REPM3 M

B CQ E/P M

Op. 74, No. 1, in C Major

I

FH/MP F#Q/MF G/F M

AE./FF BT3 A G# AE. BS CQ./D CE/D M

CS E5T R F R F# R GS B4T R C R D R ES E4T R FN R F# R GS B3T R Ç R D R M

EH FQ A/FFF M

C4T/FF D E D REP2,13 C D M

CE Q

To check what you've entered so far, press A for PLAY, followed by L (voice 1). If there's an error, re-select voice 1, go to the appropriate measure, and fix it.

You're now ready to enter the music for the second violin. Press B for ENTER/EDIT MUSIC and press 2 in response to

Voice #?

Enter the notes in the following order.

MET
6/4

F4M/FF

EQ R RW M

MET
4/4

GH/PP A M

F G M

AQ../P BS CQ/D/MP C/D M

C/MF D G4/F R M

G3M

AH. CE D M

DHT DE/D R B/DD C/DD M (the first C is already present in voice one)

CQ B CE RQ. M

REPM3 M

F EE/D C5/D REP2,2 M

CE/D/P REP2,3 C/D/MP C/D C/D/MF C/D M

CH/F A3 M

CMT

CMT

CH CT/FF B REP2,7 M

RE Q (again, the C is in voice one)

Check the second voice and proceed as before to enter voice three, the viola part.

MET
6/4

D4M/FF

G3Q R RW M (refer to *Helpful hints* for ideas on reducing chords to four voices)

MET
4/4

E4H/PP F M

D E M

F/P F#Q/D/MP G/D M

A/MF B C/F R M

C3MT

CQ C# DH M

FHT FE/D E/DD F/DD E/DD M

DH EE RQ. M

REPM3 M

D EQ G M

C4H./P DQ/MF M

EFM/F

E

RS G#3T/FF R A R B R CS E3T R F R GN R AQ/D A/D M

GH F M

EE Q

Now enter voice four, the cello part.

```
MET
6/4

G2M/FF

C2Q R RW M

MET
4/4

C4E/D/PP REP2,7 REPM

M

CE/D/P REP2,3 C/D/MP REP2,3 M

C/D/MF REP2,3 CQ/F R M

E2M

FH. F#Q M

GMT

GH C2S R C3 R G R E R M

CE/D/PP C4/D REP2,6 M

C/D REP2,3 CQ BF M

AH/P AFQ/MP G/MF M

F#M/F

G

RS G#2T/FF R A R B R CS E2T R F R GN R AQ/D F#/D M

GM

C2E Q
```

To play the piece, press A for PLAY, then the A for all voices. Experiment with different tempos until you're satisfied. To save the piece, insert a blank diskette into disk drive one, press I for FORMAT DISK, then Y in response to the prompt. (You can also use an already formatted diskette with free space on it.) Now press E for SAVE, and type the name of the file followed by pressing the RETURN key. Your file can be loaded for later playing, editing, or completing.

Planning a piece of music

General considerations

(1) Number your measures (every fifth measure is adequate). This serves as a check that you haven't omitted any measures and is invaluable when editing later.

(2) Divide your music into sections of 10 to 30 measures. Enter all the voices for each section before going on to the next one. This suggestion lets you check on the total result as you go along and make adjustments early.

(3) If a piece consistently has more than four *independent* voices, refer to the section in this manual that describes recording and recording with timing marks (from auxiliary menu).

(4) Almost all piano music and many orchestral pieces can be reduced to four or fewer *independent* voices. Decide which pitches to eliminate when four occur at the same time. Generally, you retain the lowest and highest pitches. Eliminate pitches that are duplicated in different octaves. Then retain the next two important pitches. No general rule exists for picking "important pitches" in all types of music. Usually, place the pitches so that you have the larger intervals at the bottom and the smaller intervals at the top.

Entering notes

(1) Plan dynamics by scanning the whole piece, deciding which are the softest and loudest parts, and setting their dynamic levels. The other dynamics should fit into this scheme. It's not necessary or desirable to follow printed dynamics literally. Often it's not possible. Sometimes you will need to bring a part out or push a secondary part into the background. On a diminuendo or crescendo it's best not to start it too soon. Save more of the dynamic changes for the end. It also creates a smoother effect if the dynamic changes occur at slightly different times in different voices.

(2) Immediately test the first passage in which you use a certain kind of articulation.

(3) When one or more short notes follow two or more slurred notes, the last slurred note should also be shortened to prevent the first short note from sounding slurred.

(4) Repeated notes usually have a better effect if a rest longer than the very short one automatically inserted between them is used. The short rest is appropriate only if you desire a smooth (legato) effect.

(5) If the same note in the same octave appears in two voices simultaneously, enter the note in one of the voices and a rest in the other. Due to the way the computer generates sounds, the note in one voice may be out of phase with the same note in the other voice, causing considerable decrease in the apparent volume.

Tempo relationships

(1) Some pieces may have one or more sections in a different tempo. Enter the durations of these sections using longer or shorter durations than printed. This technique will simulate the change of tempo. It's easiest to simulate the change in tempo by making the durations of the different-tempo section two (or even four) times as long if slower. Make the durations half as long if the section is faster than the rest of the piece. Then find a tempo that works for the whole piece.

Example: A piece has a fast section at ♩=180 followed by a slower section at ♩=100. Enter the first section normally. Enter the second section with durations twice as long as indicated (half notes instead of quarter notes, dotted quarters instead of dotted eighths, and so on.). Then play the piece with a tempo of ♩=190. The fast part will be slightly faster and the slow part slightly slower than the optimum. The result should be quite acceptable. If the slower section has more notes than the faster one, divide the durations of the first part in half, and enter the second section normally using a tempo of ♩=95.

(2) It's not always possible to adjust tempos to a simple relationship. If the slower section in the example above is ♩=120, the compromise between the two tempos is too great. You can achieve exact ratios by using the Dn:m notation that calls for a duration m/n times the normal length of D. Since ♩=180 is one and one-half times faster than ♩=120, the notes in the latter section must be one and one-half times their normal length if played at the fast tempo. You would enter a quarter note as Q2:3. Multiply more complex rhythms by 3/2.

Example: E.. = 1 3/4 x 3/2=21/8, or
 E8:21
Q5 (= Q5:4)= 4/5 x 3/2 = 6/5, or
 Q5:6
H3 (= H3:2)= 2/3 x 3/2 = 1, or
 H .

If you enter the slow section normally and adjust the fast section, multiply the durations of the latter by 2/3. This method works for any tempo ratio or series of tempo ratios. For best results, enter the fastest section normally and adjust the tempo of the other sections. It's easier to synchronize notes increased in length rather than decreased.

Saving memory

(1) Always use dotted and double-dotted durations where possible. This replaces 2-3 tied notes or 2-3 consecutive rests by a single note or rest.

(2) Always use the duration M for a note or rest filling a whole measure.

(3) Express tied notes by using Dn:m notation.

Example: A half note tied to an eighth note is the same as a single note written as H4:5 .

(4) Enter notes or rests lasting more than one measure in one note.

Example: Write 12 measures rest in 3/4 as RW1:9 (e.g., 36 beats rest).

By using this technique, the measures in different voices will not line up. You won't be able to use the PLAY MEASURE(S) option.

(5) Use the following items that don't take extra memory space.

    (a) Ties

    (b) Placing a rest between two identical pitches (an "invisible" rest is inserted anyway)

    (c) Measures that don't take away from the memory·for notes

Connecting the computer to your stereo system

<table>
<tr><td>Warning</td></tr>
<tr><td>Neither ATARI, Inc., nor the ATARI Program Exchange is responsible for any injuries that occur to a person, or for damages to hardware systems, as a result of following these instructions.</td></tr>
</table>

If you have an ATARI 800 Home Computer, you can directly connect the computer's sound to a stereo system by constructing a simple cable that plugs into the monitor jack. The ATARI 400 Home Computer does not have a monitor jack. It is highly recommended that you make this connection in order to hear the total capabilities of ADVANCED MUSICSYSTEM. This is particularly true in terms of clarity and low register reproduction (C1 is approximately 32 Hz). If you have a tape deck connected to your stereo, you can easily produce eight simultaneous voices. If you don't have a stereo system, a small inexpensive amplifier and a single small speaker will be a noticeable improvement over the television speaker.

Constructing your cable and connecting your systems

(1) Locate the monitor jack on the right side of the ATARI 800 Home Computer. The figure below shows the view looking directly into the jack.

Monitor Jack (ATARI 800 Computer only)
D.I.N. 5 Jack

Audio Output ——— •3   1•

Ground —— •5   4•

2•
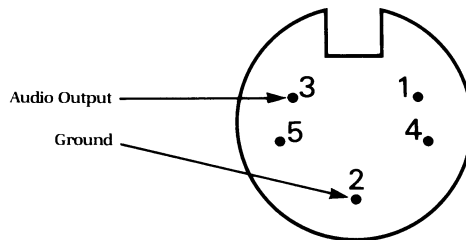
Pin #3 carries the audio signal. Pin #2 is the ground. The other pins carry video information and will not be used.

(2) You need to buy

(a) a 5-pin male DIN connector (available though the ATARI Program Exchange as APX-90002)

(b) a length of standard shielded cable

(c) an RCA-type phono plug to connect to an unused high-level input on your amplifier (AUX, SPARE, TAPE, or TUNER)

Buy the appropriate "Y" adapter if you want to connect the sound to both left and right channels.

(3) Decide on the length of cable you need and strip about 1 inch of insulation from each end. Don't cut through the braided shield. Pull the shield to one side on each end and twist into a "wire".

(4) Strip 1/2 inch of insulation from the middle conductor of each end.

(5) On one end, solder the shield to ground pin #2 on the DIN connector.

(6) On the other end, solder the shield to the "outside", or ground of the phono plug.

(7) Solder the middle wire on one end to pin #3 on the DIN connector.

(8) On the other end, solder the middle wire to the middle pin on the phono plug. Make sure that neither wire touches the ground connection. (Since it has to fit into the jack as shown above, #3 on the DIN plug is on the upper right as you look into it from the end.)

(9) Wrap each solder connection in insulated tape and crimp the strain relif (if any) securely around each end.

Be sure to set the volume very low when you first try the sound through the stereo. The input level is quite high. You'll probably want to turn down the treble control to soften the edges of the square waves that the ATARI Computer produces.

The author welcomes your calls or letters for purchasing a custom-made cable for your stereo system.

Musical demonstrations

ADVANCED MUSIC SYSTEM includes several demonstration pieces. They'll give you an idea of what you can do with the program. To hear one of these pieces, load it into computer memory using the file name given below. Then press the A key twice. Depending on your amount of computer memory, some pieces may not load from the main program. If you get the error message

NOT ENOUGH RAM

run the auxiliary program and load the piece from there. To hear the pieces played in automatic sequence, run the auto-play program.

Bee

This piece is "Flight of the Bumblebee", by Rimsky-Korsakov. Try playing BEE at different tempos to see the speed capability of the ADVANCED MUSICSYSTEM. Even at the maximum tempo, the piece is going only 1/60th as fast as possible.

Fantimp

This is the most complex of the six demonstration pieces. It is Fantasy-Impromptu in C# minor, Op.66, by Chopin. Note that the slow middle section of the piece is half the tempo of the fast outer sections. If your system has 32K of memory, you'll have to run the auto-play program to hear this piece.

Nut

This is the Overture to The Nutcracker, by Tchaikovsky. Notice the different degrees of articulation used.

WTCI5

This file name stands for J.S. Bach's Well-Tempered Clavier, Book I #5 in D. It consists of a Prelude followed by a Fugue. The fugue is half the tempo of the prelude. You will hear the fugue performed in the French style with overdotting, *notes inegales*, and suitable baroque ornaments.

Nunkomm

The last item is an organ chorale by J.S. Bach, "Nun komm' der Heiden Heiland". It shows you how successfully the ATARI Computer imitates the sound of an organ. On a stereo system the lowest notes sound like real organ pedals. At times this piece uses five or six independent voices, reduced here to four.

Error messages

Music input errors

A "window" at the top of your screen displays error messages. The various messages are described below with suggested solutions.

(1) INVALID COMMAND

This is the most common message. It indicates improper syntax, note out of range, or nonexistent command. The command displays in the error window, so you can examine where you went wrong and change your entry.

(2) MEASURE FULL

You have attempted to enter more than 255 notes in a measure.

(3) NO MORE NOTES

You've tried to exceed the memory capacity for storing notes. The number of remaining possible notes always displays on the right side of the screen after MEM= . If this happens (or you're close) you must

(a) Save what you already have onto a diskette (it's best to delete the last measure or two for later editing room).

(b) Erase all voices.

(c) Enter the rest of the piece and save it on a diskette.

(d) Run the auxiliary program.

(e) Load the first part of the piece.

(f) Merge the second part of the piece (refer to the section entitled *Merge*).

(g) Save the result on a diskette.

(4) NO MORE MEASURES

You've exceeded the memory capacity for storing measures. It's unlikely that you'll run out of measures before running out of notes. If that happens you can

(a) Put the remaining notes in the last measure.

(b) Squeeze the last several measures into one measure.

Otherwise, proceed as before by saving the piece in two or more sections and merging them.

(5) METER

Too few or too many beats in a measure causes a bell to ring and the word METER to highlight. Either enter the correct number of beats or turn the meter off.

Disk I/O errors

(1) If you try to load or merge a file that exceeds the available memory capacity the message

NOT ENOUGH RAM

appears. If this happens while you're in the main program, run the auxiliary program and try loading the file again. If you created the piece on your system, it has to fit.

(2) Any of the standard ATARI Disk Operating System and Operating System I/O errors (File not found, Disk full, and so on) may appear as a result of the following commands:

SAVE file
LOAD file
MERGE file

DISK DIRECTORY
LOCK file
UNLOCK file
DELETE file
FORMAT DISK
run MAIN, AUXILIARY, or AUTO-PLAY PROGRAM

Reference guide for Enter/Edit Music

The following is a list of the commands from the Enter/Edit Music option. You won't find these commands in a menu or prompted by the program.

Note [Oct][Dur[Tie]][/Dot][/Dyn]:
    Note: N or Na or R, where N=A, B, C, D, E, F, G a=#, F, N
    Oct: 1, 2, 3, 4, 5, 6
    Dur: D or D. or D.. or Dn or Dn :m or M or T64, where D=W, H, Q, E, S, T
      (n is between 1 and 64 inclusive; m is between 1 and 99 inclusive)
    Tie: T
    /Dot: /D or /DD
    /Dyn: /d, where d=PPP, PP, P, MP, MF, F, FF, FFF, F1, F2, F3, F4, F5, F6, F7

SCA: scale option

CTRL up arrow: move cursor up
CTRL down arrow: move cursor down
CTRL DELETE: delete note
CTRL INSERT: insert note
CTRL CLEAR: clear measure

M: go to next measure
Mx: go to measure x

INM: insert measure

MET: change meter
   x/y: new meter
   OFF: turn meter off

KEY: change key signature
   x# or xF (x is between 0 and 7 inclusive)

REPx: repeat last x notes
REPx,y: repeat last x notes y times
REPM: repeat most recent measure
REPMx: repeat measure x
REPMx,y: repeat measures x through y

P: play current measure

Q: quit, return to main menu

APX

ATARI Program Exchange
P.O. Box 3705
Santa Clara, CA 95055

Review Form

We're interested in your experiences with APX programs and documentation, both favorable and unfavorable. Many of our authors are eager to improve their programs if they know what you want. And, of course, we want to know about any bugs that slipped by us, so that the author can fix them. We also want to know whether our instructions are meeting your needs. You are our best source for suggesting improvements! Please help us by taking a moment to fill in this review sheet. Fold the sheet in thirds and seal it so that the address on the bottom of the back becomes the envelope front. Thank you for helping us!

1. Name and APX number of program.

_____

_____

2. If you have problems using the program, please describe them here.

_____

_____

_____

3. What do you especially like about this program?

_____

_____

_____

4. What do you think the program's weaknesses are?

_____

_____

_____

5. How can the catalog description be more accurate or comprehensive?

_____

_____

6. On a scale of 1 to 10, 1 being "poor" and 10 being "excellent", please rate the following aspects of this program:

_____ Easy to use
_____ User-oriented (e.g., menus, prompts, clear language)
_____ Enjoyable
_____ Self-instructive
_____ Use (non-game programs)
_____ Imaginative graphics and sound

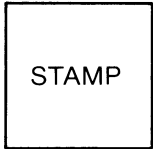7. Describe any technical errors you found in the user instructions (please give page numbers).

_____

_____

_____

8. What did you especially like about the user instructions?

_____

_____

_____

9. What revisions or additions would improve these instructions?

_____

_____

_____

10. On a scale of 1 to 10, 1 representing "poor" and 10 representing "excellent", how would you rate the user instructions and why?

_____

_____

11. Other comments about the program or user instructions:

_____

_____

_____

From

_____

_____

_____

STAMP

APX

ATARI Program Exchange
P.O. Box 3705
Santa Clara, CA 95055

[seal here]

ADVANCED MUSICSYSTEM
by Lee Actor

- **Compose original pieces and play back immediately**
- **Create complex rhythms and rapid tempos**
- **Save your pieces on diskette and merge files for large pieces**

Mozart, Beethoven, and Bach never had it so good. With the *Advanced Musicsystem*, you can use your musical skills to their fullest. This program provides a complete range of possibilities, from listening to creating.

The program offers fourteen selections. To compose a piece, you enter a musical note by specifying various features, such as octave, duration, dynamic level, and articulation. Every time you enter a note, the program reproduces it through the television speaker and displays it on the screen, where you can easily modify it. Once you create a piece, you can listen to as many as four independent voices in a 5½-octave range. A piano keyboard plays the notes with each of the four voices appearing in a different color, and you can adjust the tempo while the music is playing. Built-in synchronization functions let you construct a tape with at least eight simultaneous voices using an external tape recorder.

You can save your music on diskette, and you can merge files for very large pieces. Using the automatic play feature, you can listen to the demonstration pieces included on the diskette.

Requires:
- ATARI BASIC Language Cartridge
- Diskettes for storing music

Diskette (APX-20100)
- ATARI 810™ Disk Drive
- 32K RAM

Optional:
- One set of ATARI Paddle Controllers
- Stereo Cable
- Tape Recorder

About the author

LEE ACTOR

Lee Actor of San Jose, California was well prepared to design his comprehensive music program. He holds two degrees in electrical engineering from Rensselaer Polytechnic Institute and a master's degree in music composition. Moreover, as a former professional concert violinist with the Albany Symphony Orchestra and a composer in his own right, Lee is experienced in the complexities of music composition. Lee approached writing Advanced Musicsystem as a way to create and store his personal works. But as the project commanded more and more of his attention for a summer, he expanded the program's features and offered it to APX. The result is an outstanding program that brings Lee daily fan mail and telephone calls from all over the country. Due in part to the high quality and success of this program, Lee now works for a video game design company.