# The MIDAS Touch

## A user's guide to MIDAS III

January 18, 1984
Revision 1

TABLE OF CONTENTS

## INTRODUCTION

MIDAS-III is one of many possible control languages for the Buchla 400-series computer-aided electronic musical instruments. The language is written in assembly language for a Z80-based microprocessor and provides real-time control facilities for performance and compositional use. MIDAS-III was designed by Donald Buchla and programmed by D.N. Lynx Crowe in 1983.

This high level language offers unusual flexibility in applications of the 400 as an orchestal instrument. The user may create an infinite variety of complex "instrument definitions" and have instant access to 24 of them at any time. Each instrument definition may be named by the user to suggest the kind of sound it creates.

Instrumental timbre is determined in part by a powerful waveshaping technique used exclusively in Buchla instruments called Timbre Modulation (TM). MIDAS-III allows the user to design and store up to 24 different waveshape tables at a time for use in instrument definitions.

MIDAS-III includes a real-time graphic score editor that allows the user to create scores directly from the keyboard and to subsequently edit them interactively. Over 7000 events may be stored internal to the instrument at any time.

MIDAS-III has by default a disposition towards the 12-tone tempered tuning system, but by user-designed tuning tables and/or imaginative instrument definitions, microtonal and non-pitch oriented orchestrations are easily realized.

Data storage is divided into two types: "Orchestra" includes instrument definitions (24), waveshape tables (24) and tuning tables (4); "Score" includes all data entered by the Score Editor, and is stored separately. For fast and easy access, an entire orchestra or score may be stored on cassette tape, or 3.5" microdisk in standard systems, or on an optional 8" floppy disk in development systems.

Extensive use of labels and sub-menus makes MIDAS-III an easy language to learn and apply. Real-time parametric control on the Buchla 400 makes MIDAS-III a powerful performance language. Certain features like the score editor also allow the user to compose and experiment in a non-performance environment, thus making MIDAS-III useful as an educational tool and for composers working with film and video media.

This manual is designed to introduce the user to MIDAS-III, and is intended to be read while at the instrument so that examples in the text may be tried by the reader as an aid to learning.

## GETTING LOADED

Detailed procedures for loading MIDAS-III are covered in the Buchla 400 User's Hardware Guide.

The MEMORY STATUS switches on the rear panel must be in the following positions before loading the program (0 = down, 1 = up; in early systems, 0 = right, 1 = left):

| C | B | A | PROTECT |
|---|---|---|---|
| 0 | 0 | 1 | 0 |

After the program is loaded, the video monitor will display a main menu with the title "MIDAS-III ver. XXXXXX"; at this point, switch PROTECT to 1. You are now ready to use MIDAS-III.

The arrows to the right of the version number on the menu display indicate the correct settings of the memory status switches as viewed from the rear.

When MIDAS-III has completed loading, or when re-started by a reset, an automatic checksum test is made to verify that the program is intact. If an error occurs, a message will appear at the bottom of the screen, and the program should be reloaded.

If you encounter difficulty trying to load MIDAS-III, refer to GETTING LOADED in the Buchla 400 User's Hardware Guide.

## USING MIDAS-III

If you have just loaded the program, the main menu will be displayed, and you are ready to use MIDAS-III.

Because the main memory is battery-backed, when you turn the system off, the program will remain intact for up to a week. (The battery is recharged when the system is turned back on; a full recharge takes about an hour.)

Note that scores and orchestras are not kept in main memory, and are therefore lost when power is turned off.

If the program is loaded, but the system has just been turned on or the CPU RESET switch (on rear panel) just pressed, start the program by pressing "A" of the PARAMETER ARTICULATION switches on the front panel. (Some early vintage 400's PARAMETER ARTICULATION switches are marked 1-6 instead of A-F.)

Selecting "Init System" and "Reset System" after initial loading, or "Reset System" after restarting the program will prepare the system for use. See "Init System, Init Score, and Init Orch" further on in this document for details.

## MENU

The main menu shows the assignment of the data-entry hexpad keys on the keyboard to each of the different displays and program operations. Selection is accomplished by pressing the hexpad key that corresponds to the menu item. The main menu may always be selected from any other display by pressing the "M" key.

There are 14 displays and operations currently defined by the menu in MIDAS-III:

| OPERATION | CORRESPONDING HEXPAD KEYS | |
|---|---|---|
| | 448 Keyboard | 461 Keyboard |
| Reset System | 7 | 8 |
| Initialize System | 8 | 9 |
| Initialize Score | 9 | A |
| Initialize Orchestra | F | B |
| Make Tape | 4 | 0 |
| Make Disk | 5 | 1 |
| Set Phase | 6 | 2 |
| Edit Score | 1 | C |
| Edit Instrument | 2 | D |
| Edit Waveshape | 3 | E |
| Edit Tuning | D | F |
| Load & Store | A | 5 |
| Fine Tune | B | 6 |
| CRT Align | C | 7 |

Note that there is an immediate geographic correspondence between the 4 x 4 menu and the first four rows of edit keys on the 448 (touch) keyboard. For the 461 (piano) keyboard, the top 2 menu rows correspond to the left 8 edit keys, and the bottom 2 menu rows correspond to the next group of 8 edit keys.

## EDIT SCORE - The Score Editor

In this section the EDIT SCORE display is described. Specific editing details follow in the section "USING THE SCORE EDITOR".

Enter the Score Editor by pressing the hexpad key corresponding to the block labeled EDIT SCORE in the main menu. On the 448 keyboard this will be a "1", on the 461 a "C".

## The Graphic Score

The EDIT SCORE display includes a horizontally-scrolling graphic score that shows:

-- 2 traditional five-line staves preceded by a treble and bass clef

-- periodic ledger lines, 3 above the treble staff and 4 below the bass staff

-- a TIMING track showing markers for beats, sections and jumps.

-- an UPDATE track showing markers that indicate that something is being changed in the non-graphic portion of the score editor (essentially the lower third of the display), as well as markers for STOPs.

The graphic score shows closures, sustains and releases of performance keys in a form similar to piano-roll notation. (See the Buchla 400 User's Hardware Guide for a discussion of performance key numbers on the 448 and 461 keyboards.) The range of the display is F1 to F6. Middle C (C4) is located in the center of the space between the staves. Accidentals are indicated by a forward slope on the leading edge of the note for a flat and a backward slope for a sharp.

## Graphic Score Cursor

The vertical line in the center of the score indicates present time; to its left is past time, to its right, future time. This line is also the Graphic Score Cursor, and is manipulated by the Front Panel "SCROLL" joystick in the SCORE/TEMPO CONTROL area. The Graphic Score Cursor may also be manipulated in this display by use of the four cursor control keys (arrow keys). At this point, the cursor may only be moved by the joystick vertically. The cursor control keys will also cause horizontal movement in increasing time. When the cursor is moved out of its lowest position, two opposing arrows appear that indicate its position in the vertical plane. The user should experiment with vertical movement of the Graphic Score Cursor at this time. Horizontal cursor movement will be covered in a subsequent part of this manual.

## The Non-Graphic Score

The non-graphic part of the EDIT SCORE display (approximately the lower third) is divided into 3 sections:

The upper section is a matrix display of the six voices A-F in vertical columns versus data entry fields for 4 parameters arranged in three rows. The data affects only the voice in whose column it appears. The 4 parameters are:

1. VOC - Instrument definition assigned to the voice (00-24)

2. TRN - Transposition in semitones from concert pitch (-19 to +23 in the 448 keyboard version, -8 to +15 for the 461 version)

3. D/ - Dynamics, from 0 (ppp or -12 db) to 7 (fff or +6 db) with 4 approximately equivalent to mezzoforte (0 db)

4. /L - Location in stereo space, from 0 (far left) to 8 (far right) with 4 centered

The non-graphic portion of the Score Editor display also includes data entry fields for parameters that are not voice-specific. Data entered in these fields affect all the voices. They are:

TUN - At the far right of the line labeled VOC, one can specify a tuning table number from 0-4 in the field labeled TUN. Four user-defined alternate tunings are possible in addition to the default 12-tone tempered system (#0). (See EDIT TUNING.)

INTP - Below TUN is the Interpolate Field. This field includes the two data entry locations directly under the label INTP. In this field, the user may specify the transition time in seconds from old to new values. The upper data field applies to dynamics and location (the upper data field), and the lower data field to score tempo. Interpolation times may range from 00.0 to 65.4 seconds.

M,S,F,B and TEMPO - The line below the label "D/L" keeps track of where you are in the score. The displayed number of minutes (M), seconds (S), frames (F) and beats (B) correspond to the present-time Graphic Score Cursor. There are 16 frames per beat.

The Time display (M and S) corresponds to real time when the tempo is set to 60 beats per minute; a second is always 16 frames, a minute 960 frames.

Those interested in film and television media may note the following relationships:

$$\text{Beats per Minute} = \frac{60 * \text{Frames per Second}}{16}$$

| | Frames per Second | Beats per Minute |
|---|---|---|
| Nominal | 16 | 60 |
| Film | 24 | 90 |
| Television | 30 | 112.5 |

MEM - The upper right hand corner of the Score Editor display shows the number of events that may be entered in the score. The number decreases as events are entered, and increases as they are deleted. A score may contain 7148 events. A note requires two events (closure and release), jumps require 2 events, and all other operations require 1 event.

## Menu

The remaining section of the display (the bottom two lines) shows the data entry menu that corresponds to the editing hexpad keys.

The vertical position of the Graphic Score Cursor determines which menu items are available at any time. Most menu items are always available. The note entry items, Nat and Acc, are only available when the score cursor is in the note field (in the staves). When the score cursor is not in the note field, Acc functions to select the signature.

Voc - Instrument definition number
Dyn - Dynamic
T/T - Tempo / Tuning table number (toggled)
Int - Interpolation time for DYN or LOC

Trn - Transposition
Loc - Location
Nat - Natural note
Acc - Accidental note / Signature selection

Beg - Begin section marker
End - End section marker
Stp - Stop the score clock
Jump - Jump to the beginning of a section

Cpy - Copy and insert a section
Mrg - Merge a section
Ins - Insert a new segment of notes from the keyboard
GoTo - Go to the beginning of a section

## USING THE SCORE EDITOR

### Edit and Play Modes

The Score Editor has two modes:

1. Edit Mode - Front Panel EDIT switch enabled (LED on)
2. Play Mode - Front Panel EDIT switch disabled (LED off)

In the Edit Mode, the user may edit data with the score editor; notes may be entered and stored as a graphic score, and data may be entered and stored in the non-graphic score. Non-graphic data entries are accompanied by markers in the UPDATE or TIMING track. Data is displayed in the appropriate field and highlighted when the corresponding marker is aligned with the score cursor.

In the Play Mode, the user's data in the score editor is protected; the score will play, and enabled voices may be played from the keyboard without affecting the score (see Enabling Voices below). Notes may not be entered in the score, and changes of non-graphic data will not be marked in the UPDATE orTIMING track nor will they be stored.

To prevent accidental alteration of the score, when in the Edit Mode notes will not be entered from the performance keyboard outside of the Score Editor.

### Non-Graphic Data Entry

Cursor movement for data entry is achieved by a combination of hexpad-driven menu entries and toggled selections using the "+" and "-" keys. The Graphic Score Cursor, the vertical line in the center of the graphic score, is manipulated by vertical movement of the "SCROLL" joystick in the SCORE/TEMPO CONTROL area of the Front Panel.

### Correcting Errors

To abort a data entry operation before it is completed, go to the main menu and then return to the score display. (Press "M", then "Edit Score" from the hexpad.)

**Enabling Voices**

Each voice may be enabled in one of three modes:

1. Voice enabled for editing and playing - in the Edit Mode, notes for this voice may be entered in the score from the performance keyboard or hexpad. In the Play Mode, notes played from the keyboard will sound this voice but not be entered in the score. The voice will also sound when played by the score. The voice letter will be brightly highlighted in this mode.

2. Voice enabled for score playing but not editing - notes previously entered in the score for this voice will be displayed and will sound, but may not be edited. This voice will not be triggered by notes played from the keyboard. The voice letter will be of normal brightness in this mode.

3. Voice disabled - this voice will not play, nor can it be edited. Notes previously entered in the score for this voice will be tacet as long as the voice is in this mode. The voice letter will also disappear in this mode.

These modes are selected by pressing the hexpad key corresponding to "Voc" in the menu (Graphic Score Cursor in its lowest position), then the voice letters whose modes are to be changed, followed by a "+" or a "-". Repeated use of this command with +'s scroll the mode selections in one direction, -'s in the other.

All six voices are enabled for editing by default. In the Edit Mode, changes in voice enable status are stored in the score and accompanied by a marker in the UPDATE track.

Example: To change the enable status of voices E and F, make sure the Graphics Score Cursor is in its lowest position; press "Voc" from the hexpad, then "E" and "F", then a "+".

Entering "Voc" followed by "-" while in edit mode will enter the current edit status of the voices into the score. When the score is subsequently executed the voices will take on the status entered in the score when the status change events are encountered.

## PLY

Voices are edited "polyphonically" using a rotational voice assignment algorithm. This mode is indicated in the lower left corner of the graphic score display by the word PLY. It is always active in the Edit Mode. Only edit-enabled (highlighted) voices are included in the rotational scheme. Thus, to enter one voice at a time, only that voice should be edit-enabled.

In the Play Mode, when no other data entry functions are in use, the polyphony algorithm may be disabled by entering a "-". Repeated "-"'s toggle between enabling and disabling the Polyphonic Mode. With PLY disabled, the keyboard plays in a "chorus" mode - all edit-enabled (highlighted) voices will sound with each key closure.

## Voc - Instrument Definition Assignment

An instrument definition may be assigned to any voice or voices as follows:

1. Place the Graphic Score Cursor in its lowest position and press the hexpad key for "Voc". The label "VOC" will be highlighted in the display.

2. At this point, entering a two-digit number from 00-24 will enter that number as an instrument definition for all of the edit-enabled (highlighted) voices.

3. If after entering "VOC" you first enter a letter or letters A-F, a two-digit number from 00-24 will then enter that number as an instrument definition for only those voices.

Examples: To enter Instrument 01 into all the enabled voices, enter "Voc" from the hexpad, followed by "01".

To enter Instrument 01 into voices A, C and E, enter "Voc" from the hexpad, then "A","C" and "E", followed by "01".

Remember that unless other intrument definitions have been loaded into the instrument library all instrument definition numbers will contain the default instrument definition, and changing the numbers will not change the resulting sound.

## Instrument Library Index

Entering "Voc" followed by a "+" will display a table, the Instrument Library Index, showing the names of the 24 instruments in the current instrument library. These names are assigned in the EDIT INSTRUMENT display. "Default Inst" will be listed for every definition number unless instrument definitions with other names have been loaded or created by the user. (See EDIT INSTRUMENT and LOAD and STORE.)

Instrument definitions may be assigned to voices while the instrument library index is displayed by entering the two digit number corresponding to the desired instrument definition.

Example: Enter "Voc" from the hexpad, then "+". The instrument library index is now displayed. Enter a two-digit number from 00-24 and this number will be entered as an instrument definition for the enabled voices. The instrument library index will be replaced with the normal score display after the data has been entered.

**Dyn and Loc - Dynamics and Location**

These are single-digit entries that are entered similarly to VOC.

The range for dynamics is 0-7, with 4 equivalent to mezzoforte. Steps above 4 are in increments of 2 db; those below are in steps of 3 db. This provides a dynamic range of from -12db to +6db.

The range for location is 0-8, with 4 corresponding to center in stereo space and 0 and 7 corresponding to left and right channels, respectively.

Example: Enter "Dyn" or "Loc" from the hexpad, then the value. This value will be entered into each enabled voice. If the value entry is preceded by specific voice letters, it will only be entered into those voice fields selected.

**Intp - Interpolation**

Interpolation times between old and new values may be assigned to D/L and TEMPO. The default value is 00.0. The current interpolation affects all voices. Interpolation values may range from 00.0 to 65.4 seconds.

Enter an interpolation time value by pressing "Intp" from the hexpad. The label INTP and the upper data field (for D/L) will be highlighted. Repeatedly pressing this key will toggle the data entry field between D/L and TEMPO. When the desired field is highlighted, enter the 3-digit value.

The interpolation time must be entered earlier in the score than the new D/L or TEMPO value that is to be interpolated to. Note that each transition to a new value proceeds at a rate determined by the interpolation time displayed at the initiation of the transition.

**Trn - Transposition**

The pitch reference of a voice or voices may be offset from concert tuning as follows:

1. With the Score Cursor in its lowest position, press the hexpad key for "Trn". The label "TRN" will be highlighted.

2. You may now enter the transposition as a two-digit value representing the number of keys by which notes played will be offset. At this point, the value will be entered into the TRN field of every enabled voice. Otherwise, first specify the voices to be affected by the transposition data by entering their letters; then enter the transposition number.

The transposition range is -19 to +23 keys for the 448 keyboard version and -8 to +15 for the 461. This gives both versions the same range, A1 to G#7, assuming the default tuning table is in use.

Example: Enter "Trn" from the hexpad, then "+07". This will raise all the enabled voices by a perfect fifth.

Note that the above example assumes that the equal tempered 12 tone tuning (default tuning) is being used. Transposition is performed on the input to the tuning table and should perhaps be regarded as a displacement in the key number that is actuated. In other words, activation of key #10 with a transposition of +07 will sound the pitch of key #17, which will most likely not be a perfect fifth for alternate tunings.

**T/T - Tempo and Tuning**

The T/T menu entry toggles between Tempo and Tun on the display. The field highlighted is the one which will be effected.

Score Tempo may be changed from its default value of 060 beats per minute simply by entering "T/T" from the hexpad and then the desired 3-digit value in beats per minute.

Tempo may also be varied from the Front Panel SCORE/TEMPO CONTROL area using the SCROLL joystick, the tempo MULTIPLIER and the vernier control. See the discussion of the score clock control for details.

Alternate tuning tables, user-defined in EDIT TUNING, may be called by entering the number of the desired tuning table in the Tun field, as numbers 1-4. Table 0, the default table, is a traditional 12-tone equal tempered tuning system.

Press the hexpad key for "T/T" twice (until Tun is highlighted), followed by the desired tuning table number. This table affects tuning for all of the voices.

**GoTo - Go to the beginning of a section**

This hexpad entry followed by a two digit decimal number will take you to the section labeled by the specified number. This action will not be recorded in the score in the Edit or Play Modes, but is useful for editing and performance.

Entering a "+" before you enter the section number will cause a display of all possible section numbers to appear with the currently active ones highlighted.

Section-labeling is done with the Begin and End section markers and is dealt with below in "SCORE ACTIONS: Begin and End".

Entering "GoTo" followed by a "-" and a four-digit number will take you to that beat number in the score. The beat number you enter is displayed in the data field in the top line of the display. This field is used during data entry, and is also updated by the score display task to indicate the exectution of jumps, or parameter changes, and to indicate the occurence of Begin and End Section markers.

**RUN - Score Clock Control**

Before the graphic score may be scrolled, the score clock must be turned on. This may be done at any time in which there is no other data entry function in use by pressing a "+". The word "RUN" in the lower lefthand corner of the graphic score display is highlighted, and the score begins to run at the prescribed tempo (60 beats/minute by default). Alternate depressions of the "+" will toggle the score clock off and on.

Score tempo may be controlled from the Front Panel SCORE/TEMPO CONTROL area as well as from the Score Editor while RUN is highligted.

The MULTIPLIER switches exactly halve or double the tempo specified in the Score, and the vernier control provides for intermediate settings.

The REMOTE switch allows the score to be controlled from the REMOTE pulse input port on the Front Panel.

The SCROLL joystick will move the score forward when in the Play Mode, and in both directions when in the Edit Mode.

The score may be moved in pixel increments with the left and right arrow keys.

These controls are additive. Therefore, for frame-by-frame manipulation of the score, press the REMOTE switch and use the SCROLL joystick. Remember that the Score Clock must be turned on ("RUN" highlighted).

## SCORE ACTIONS

### Beg and End - Begin and End section markers

Up to 100 sections (00-99) may be labeled in MIDAS-III. Section 00 always corresponds to the beginning of the score (Beat 0). Sections are labeled in the following manner:

1. Position the Score Cursor in EDIT mode at the desired place in the score.

2. Enter "Beg" from the hexpad, followed by 2 decimal digits in the range 01 thru 15. This labels the beginning of the section.

3. Move the Score Cursor to where the end of the section is desired. Enter "End" from the hexpad, followed by the same two digits entered for "Beg". This labels the end of the section.

Section Begin and End labels are accompanied by markers in the TIMING track and by display in the action window at the top of the screen.

### Jump - Jump to the beginning of a section

The "Jump" instruction asks the score to go to the beginning of an indicated section a specified number of times. To initiate a jump, scroll to where the jump is desired, and enter "Jump" from the hexpad followed by 3 digits. The first 2 (decimal) digits name the section to be jumped to; the third (hexadecimal) digit determines how many times the jump will be executed, up to 15 times, 0 to F.

In the Edit Mode, jumps are indicated by marks in the TIMING track and a display in the action window, but are not performed. In the Play Mode, the jumps will be graphically "written out" in the score as they are performed as well as displayed as previously described..

### Stp - Stop the score clock

The "Stp" (stop) instruction causes the score to stop by turning off the Score Clock. It functions only in the Play Mode. Enter a STOP by pressing the hexpad key for "Stp" when in edit mode. A "Stop" mark will be displayed in the TIMING track and STOP will appear in the action window.

**Cpy - Copy a section**

This editing instruction is used to copy a section of the score and insert it into the score where the cursor is when the command is executed. Scroll to the point in the score where the addition is desired, enter "Cpy" from the hexpad followed by the 2 digit number of the section to be copied. Only those voices enabled for editing will be copied, and edit markers and jumps appearing within the section will be ignored. The timing of subsequent events in the score will be adjusted automaticaly to reflect the presence of the copied events. The copy command will be ignored if there are not enough events left from which to make the copy.

**Mrg - Merge a section**

"Mrg" works similarly to "Cpy", except that the copied section is superimposed on the existing score rather than inserted. Scroll to where the merge is desired, enter "Mrg" from the hexpad followed by the number of the section to be copied and merged. Two sections using the same voice may not be superimposed, nor may the section being merged from overlap the area being merged into. This instruction is useful when the activities of one voice are repeated several times on top of other voices, as in a repetitve rhythm track. As with copy, only voices enabled for edit will be merged, and section markers and jumps within the merged section will be ignored.

**Ins - Insert notes from the keyboard**

The "Ins" instruction allows the user to insert extra score time in the middle of an existing score. Notes and other actions may be added during the insertion. Select "Ins" from the hexpad. The display will be blanked to the right of the Score Cursor and "Ins" will be highlighted on the display to indicate that insert mode is active. The Insert Mode is disabled when "Ins" is entered a second time from the hexpad. The display will be refreshed at that time to show the result of the insert operation.

Never try to store a score while in the Insert Mode. This can cause loss of events from the score in the copy being stored.

**Delete (X) in the TIMING track**

Deletions of sections or partial sections may be made with the Graphic Score Cursor in the TIMING track by pointing the cursor directly at the "Begin" marker of the section to be deleted and pressing an "X". Only sections with both "Begin" and "End" markers may be deleted in this way. Times in the score will be adjusted to reflect the removal of the section. If only some of the voices in a section are to be deleted, disable the other voices from edit mode. The delete command will then only delete the voices from the section which are enabled for edit. The length of the score in time will not be altered in this case.

If one wishes to delete the markers without deleting the section, delete the "End" marker first, then delete the "Begin". This will result in only the markers being deleted.

Stops and jumps may be deleted by positioning the cursor on them and pressing the "X" key.

## THE NOTE FIELD

When the Graphic Score Cursor is moved into the Note Field, the Nat and Acc editing actions are available.

### Nat and Acc - Natural and Accidental note entry

These commands allow the user to "draw" the score note by note.

To draw a note, point the Score Cursor to the time in the score where the note is to begin and enter "Nat" from the hexpad. A highlighted mark will appear under the cursor, and the note will continue until "Nat" is again entered from the hexpad. The "Nat" menu entry will be highlighted during note entry to remind the user that a note is being entered, and will remain lit until the note is terminated. Only cursor motion is allowed while either "Nat" or "Acc" are illuminated during note entry. To begin an accidental, enter "Acc" rather than "Nat".

Accidentals will be drawn as sharps by default; by entering "Acc" followed by "-" with the score cursor outside the note field the notes begun with "Acc" will be drawn as flats. "Acc" followed by "+" with the score cursor outside the note field will cause notes begun with "Acc" to be drawn as sharps. A sharp or flat sign will appear in the upper left corner of the score display to indicate the mode selected. This signature selection affects the drawing of all accidentals in the score.

### Delete (X) in the Note Field

Deletions of notes may be made while in the Edit Mode by positioning the Score Cursor line on the beginning of the note to be deleted (the vertical pointers may actually be anywhere in the Note Field) and pressing an "X".

Only the notes of edit-enabled voices which begin at this time will be deleted in this manner. Thus, one may delete one or more notes of a chord by enabling only the voices of the objectionable notes. Those notes of the chord in voices not enabled for editing will not be affected.

The MEM counter will log each note deletion by incrementing its value by 2 and the graphic score display will be updated to show the result of the deletion.

## SCORE EDITING SUGGESTIONS

For ease of editing and to reduce computer overhead, the user should enter as few score editor parameter updates per frame as possible (ideally one update per frame).

Remember that an interpolation time must precede the new value that is to be affected.

Avoid changing an instrument definition assignment in a voice that is still sounding a note; otherwise some strange sounds during the update may ensue.

Remember that section 0 is always the complete score, beginning at beat 0. It can be "Jump"ed to, or can be the target of a "Go To" operation, but cannot be the source of a copy or merge. Section 0 cannot be redefined as other than the complete score, nor can it be deleted as a section. To clear the score, use the "Init Score" function on the main menu.

## EDIT INSTRUMENT - The Instrument Definition Editor

In an instrument definition, the user may specify:

* a time-varying function for each of the five basic parameters: PITCH (P), TIMBRE (T), INDEX (I), LEVEL (L) and FILTER (F). Each function may include one of 3 types of loops with unique endpoints.

* control-voltage sources and scaling multipliers to be attached to each of the parameters.

* enabled or disabled analog control of pitch.

* timbre and/or frequency modulation.

* modulation data, to be interpreted as either an absolute frequency or as a ratio of the modulation frequency to the signal frequency.

* filter Q (resonance).

* waveshape table.

### Cursor Movement

Both text and graphic cursors are used in this display. The text cursor is manipulated with the 4 cursor arrows in the editing area of the keyboard, and is used to enter data in non-graphic fields.

The graphic cursor is used for drawing the parametric functions and for selecting the ASCII characters for instrument names. In the graphic function displays, this cursor appears as a highlighted point. For the Name Field, it appears as a highlighted block. This cursor is manipulated using the editing joystick; when editing the functions, point coordinates may alternatively be entered by positioning the text cursor in the appropriate field and typing in the desired value.

Note that when the text cursor is in the Point Field (labeled "Point"), the vertical cursor arrows move the graphic cursor through the graphic function displays. Therefore, to position this cursor in fields lower than the Point Field, it must first be moved out of the Point Field horizontally by at least one data field.

### Edit key usage

In this display the edit key, when lit, causes the currently selected voice to be selected monophonically so that changes made in the instrument definition can be heard immediately. To hear the results polyphonically, store the updated definition, reset the edit key, and then reset the system using the reset key.

### Delete (X)

An entire instrument definition display may be cleared (deleted) by positioning the text cursor in the instrument number field ("Instr") and pressing "X". Do this if you want to start an instrument definition from scratch.

You can also clear the loop markers and loop count of a single function by positioning the text cursor on the line containing the count field of the function whose loop parameters you wish to clear and pressing "X". The display will be updated to show the removal of the markers and the count will be reset to 0.

To clear a single function, position the text cursor on the line containing the function ID, (P, T, I, L or F), and press "X". The function will be cleared and the display will be updated to show the reset values.

### Calling an Instrument Definition

An instrument definition already loaded into the Orchestra Library may be called to the display by entering its number in the Instrument Number Field ("Instr") and typing a "-". This will assign the instrument definition being called to the voice currently being edited and cause it to be displayed.

### Storing an Instrument Definition

To store an instrument definition in the Orchestra Library, position the text cursor in the instrument number field ("Instr") and press a "+". This stores the currently displayed instrument. It will overwrite any instrument definition that may have previously been assigned to the same instrument number.

Note that instrument 0, the default instrument, cannot be altered in this manner and attempts to store into instrument 0 will be ignored.

If you wish to make an altered version of an existing instrument without losing the original, copy it into another instrument number. First, call the existing instrument to the display; then enter the new number to receive the copy into the instrument number field and press a "+" to store it in that number. The original instrument with the old number will be left intact.

A newly stored instrument definition will only be heard in the voice in which it was edited until the Front Panel reset switch is activated. Only then will the new definition be attached to other voices assigned the same instrument number in the score editor.

When developing new instrument definitions it is helpful to assign all of the voices to the same instrument number in the score display and then make use of the Front Panel reset switch while in the instrument display to update the voices.

## Time Varying Functions

The Graphics cursor used for drawing time varying functions is manipulated in the following manner:

1. This cursor is enabled only when the text cursor is placed in the Point Field (labeled "Point"). Use the 4 cursor arrows to do this.

2. Select the time varying function to be edited by repeatedly pressing the vertical cursor arrows. As you scroll from one parameter to the next, a point in each parameter's graphic display is highlighted. This is the graphics cursor.

3. Specify the point to be attached to the graphics cursor by entering its number, 0-9, in the Point Field. These points are always numbered in consecutive order from left to right. Therefore, the first point is always 0, the second one 1, etc. The point you specify in the Point Field will be attached to the graphic cursor and becomes highlighted.

Not all 10 points are necessarily used in a function. If there is no function, only one point will appear. Such is the case for PITCH (P) in the default instrument, Instr 00, where the point appears at the default value of 5.0 volts.

Points will be added to a function in consecutive order. Thus, if you try to call Point 9 from the Point Field for the PITCH function of Instr 00, you will only get Point 1, the second consecutive point.

4. The point highlighted by the graphic cursor may now be moved in any direction either by using the editing joystick or by entering the VALUE and TIME coordinates next to the point field. Position the text cursor in these fields with the cursor arrows and enter the values from the hexpad. VALUE accepts a mixed-base value coresponding to a voltage from 0 - 10.0 (A0) nominally, and a maximum voltage of 12.7 (C7). (See PATCH-VI User's Guide APPENDIX C: Mixed-base Representation of Numbers.) TIME accepts values in seconds from 00.001 to 32.000. (The time registered by the computer may vary slightly from the data entered due to resolution considerations.) The TIME axis in the graphic display is exponential, and ends at 8 seconds; points specified outside this range will cluster at the righthand edge of the display but will be accurately executed at the times indicated for them in their time fields.

### Enabling a Parametric Function

When the parameter label to the left of the graphic function display is of normal brightness, that function will only be activated once, when the instrument definition is called from the Score Editor.

For the function to be activated by key closures, the parameter label must be enabled (highlighted). This is done by positioning the text cursor under the desired parameter label and entering a "+". The label will become highlighted, and the function will now be initiated each time a key closure occurs that calls the corresponding voice. The function label may be dimmed by entering a "-" to dim the label.

This feature allows certain functions to maintain continuous asynchronous loops (see LOOPS directly below) and also reduces computer overhead for those parameters for which functions have not been defined.

### Loops

The Loop Field is located directly below the parameter label. Each function may include one of 4 types of loops:

A - sustain: the loop cycles as long as the key is closed.

B - enable: the loop cycles only when the key is released.

C - continuous: the loop cycles regardless of key status.

0-9: a number entered in the loop field causes the loop to cycle the specified number of times.

Enter a loop as follows:

1. Position the text cursor in the Point Field.

2. Scroll to the graphic function display for the desired parameter using the vertical cursor arrows.

3. Enter the number of the point in the function where the beginning of the loop is desired into the Point Field.

4. Type "+" to begin the loop at that point. A horizontal line, the "Loop Indicator", appears at the top of the function display being edited, originating from the specified point.

5. Enter the number of the point where the end of the loop is desired into the Point Field.

6. Type a "-" . This ends the loop; the horizontal "Loop Indicator" line stops at that point.

7. Move the text cursor into the Loop Field, using the 4 cursor arrows.

8. Enter the loop type, A, B, C or a number 0-9 in this field.

**Control-Voltage Sources**

The 5 basic parameters, PITCH (P), TIMBRE (T), INDEX (I), LEVEL (L) and FILTER (F) may also be enabled to accept control voltages from external sources. This is done in the 3 data fields to the right of each parameter label. Possible control-voltage sources include:

Pedal - Control-Voltage Foot Pedal (Pedal Input C on the rear panel)

Extrn - Front Panel Control-Voltage Inputs 1-4

Horiz, Vert - Performance Joystick (Horizontal and Vertical)

Key - Key Voltage (proportionally higher voltages for higher key numbers)

Comp - Complement Key Voltage (the higher the key number, the lower the voltage)

Random - Random Control-Voltage

Envel - Control-Voltage from the Auxilliary Signal Envelope Follower

These control-voltage sources are scaled by positive or negative source multipliers in the adjacent two data fields.

Assign a control-voltage source as follows:

1. Position the text cursor in the data field directly to the right of the label of the parameter to be affected by this control-voltage. Possible entries are displayed as a 2-line menu that appears at the bottom of the Instrument Definition display and corresponds to the two bottom rows of the 448 keyboard hexpad or the two right rows of the 461 hexpad.

An "Extrn" entry requires specification of the Front Panel Control Input port number 1-4. After entering "Extrn", that menu label becomes highlighted, indicating that the port number is to be entered.

Entries from the hexpad will be shown in the data field with the following abbreviations:

| | | |
|---|---|---|
| Pedal | - Foot Pedal | P |
| Extrn | - External Voltage 1 | 1 |
| | External Voltage 2 | 2 |
| | External Voltage 3 | 3 |
| | External Voltage 4 | 4 |
| Horiz | - Horizontal Joystick | H |
| Vert | - Vertical Joystick | V |
| Key | - Key Voltage | K |
| Comp | - Key Complement Voltage | C |
| Random | - Random Voltage | R |
| Envel | - Envelope Follower | E |

The data field adjacent to the Control-Voltage Source Field accepts either a "+" or a "-", and the third data field accepts a hexadecimal source multiplier code, 0-C.

**Multiplier Codes**

The relationship between the multiplier code and the actual multiplier is as follows:

| Code | Multiplier |
|---|---|
| 0 | 0.00 |
| 1 | 0.01 |
| 2 | 0.03 |
| 3 | 0.05 |
| 4 | 0.07 |
| 5 | 0.09 |
| 6 | 0.13 |
| 7 | 0.18 |
| 8 | 0.25 |
| 9 | 0.38 |
| A | 0.50 |
| B | 0.75 |
| C | 1.00 |

### Key Pressure and Velocity

The three data fields adjacent to the Loop Field for each parameter determine the effects of key pressure and/or velocity (461 keyboard version only). Pressure (P), Velocity (V) or Both (B) or null (blank) may be toggled by pressing the "+" and "-" keys with the text cursor in the first of these data fields. The second field accepts a "+" or "-" sign for the multiplier; the third field accepts a hexadecimal digit from 0 to F as the multiplier code. The relationships between multiplier codes and actual multipliers are the same as for the previously described control voltage multiplier codes.

### Cntl - Control

This field selects control options for the instrument definition. The significance of the 2nd,3rd and 4th options are discussed in "Mod - Modulation".

"Cntl" has 5 one digit data fields. The first 4 with two possible entries. entries are selected by positioning the text cursor in the data field and typing a "+" for one selection and a "-" for the other:

1. "+" enters "A" into the first field. This enables analog control of pitch, which includes the Parameter Articulation Pitch knob, the Pitch Control Voltage input, and the Fine Tuning control, as well as the control voltage, pressure and velocity inputs specified in the previously mentioned fields. "-" enters "a" into the display and disables all analog control of pitch.

2. "+" enters "F" into the 2nd field and specifies that the modulation data (Mod) be interpreted as an absolute frequency. "-" enters "R" into the display and specifies that the modulation data be interpreted as a ratio of the modulation frequency to the signal frequency.

3. "+" enters F into the 3rd field and specifies that Frequency Modulation (FM) be performed. "-" enters "f" into the display and disables FM.

4. "+" enters T into the 4th field and enables Timbre Modulation (TM). "-" enters "t" into the display and disables TM.

5. "+" enters "1" into the fifth field; subsequent actuations increment the display to a maximum of 3. "-", as you by now have guessed, decrements the displayed number. Non-zero numbers entered in the field cause key velocity to affect dynamics, with larger numbers resulting in greater velocity sensitivity. Note that the initial dynamics are established in the score, and that for maximum velocity sensitivity, the score dynamics should be set to zero.

**Mod - Modulation**

This field determines, in conjunction with the Control Field (Cntl) how the 400 will perform frequency and/or timbre modulation for the instrument definition. There is one modulation oscillator for each primary oscillator; thus the same modulation frequency will be applied to both frequency and timbre if both are selected in the Control Field.

The Modulation Field accepts a 3-digit hexadecimal value. The interpretation of this value is dependant on the selection of Ratio (R) or Frequency (F) in the Control Field; it represents the frequency of modulation expressed either as a ratio between the frequency of modulation and the primary frequency, or an absolute value.

Frequency Modulation as performed by the 400 is exponential and shifts the resulting pitch according to the modulation index. No pitch change occurs when the modulation index is 0.

Only even numbers, expressed in hexadecimal notation, are accepted as data. For the relationship between the hex data and frequency of modulation, see APPENDIX E: Pitch - Frequency - Hex Data - Transposition in the PATCH V User's Program Guide.

**Modulation Ratios**

The hex data representing ratios of modulation are determined by the following equation:

$$n_h = 180_h \log_2 r + 800_h$$

where h indicates hexadecimal notation
r = ratio desired
n = data entry

Thus, if the ratio is 1:1, the corresponding hexadecimal data would be 800. The modulation frequency would be the same as the signal frequency.

Note that when the frequency of modulation is expressed as a ratio, an increase of 1 in the second digit represents an increase of a quarter-tone in the modulation frequency relative to the carrier frequency, while an increase of 2 in the third digit represents an increase of a 16th of a tone in the modulation frequency.

## Useful Modulation Ratios

Some useful harmonic ratios and their corresponding hexadecimal equivalents are listed in the table below. Used for Timbre Modulation, these values often produce stable tones with strong subharmonics that shift the fundamental. (A ratio of 1:4 will frequently shift the perceived fundamental down 2 octaves.) Values close to those shown will generally produce more complex, often clangorous or dissonant tones. Experimentation is recommended to familiarize oneself with the effects of modulation ratios.

| Ratio | Hex Equivalent |
|---|---|
| 1:4 | 500 |
| 1:3 | 5A0 |
| 1:2 | 680 |
| 3:5 | 6D6 |
| 2:3 | 720 |
| 3:4 | 760 |
| 4:5 | 784 |
| 1:1 | 800 |
| 5:4 | 87C |
| 4:3 | 8A0 |
| 3:2 | 8E0 |
| 5:3 | 91A |
| 2:1 | 980 |
| 3:1 | A60 |
| 4:1 | B00 |

**FLQ - Filter Q**

This field selects the Q, or resonance of the voltage-controlled low-pass filter. It has a range of 0 - F hexadecimal, from low to high Q respectively.

**Wshp - Waveshape Table**

This field selects the waveshape table used in this instrument definition. Specify the waveshape table number (0-24). (See EDIT WAVESHAPE.)

**Naming the Instrument**

To name your instrument definition, position the text cursor in the name field. This field consists of 12 entries that are selected from the standard ASCII character set that appears whenever the text cursor is in the Name Field.

Each character is selected by moving the graphic cursor (the highlighted block) to the desired character with the editing joystick; enter it into the position marked by the text cursor by pressing a "+" or a "-". The blank at the beginning of the character set is a "space" character.

## EDIT WAVESHAPE

Select this editing display from the main menu (M) by pressing the corresponding hexpad key.

The waveshape display is a graphic representation of the transfer function used to create the timbral character of a voice.

Each waveshape table is a 64-entry table containing values ranging from 0 to 255. A sinusoidal scanning function is used to access entries in this table which are then used to determine the oscillator output value at that point in the scan. At low TIMBRE settings, the central portion of the table is scanned; as TIMBRE is increased, the sinusoidal function scans proportionally wider sections of the table.

Examples: Given a waveshape table that has a straight diagonal line in its center and rough contours at the outer ends, a low TIMBRE setting would give a sinusoidal output; a high TIMBRE setting would give a complex waveshape determined by the contours of the outer portions of the table.

A waveshape table consisting of a horizontal line will result in no acoustic output because the scanning sinusoidal function sees no change in value from one point to the next.

### Editing Waveshapes

Entries in the waveshape table are sent to the oscillator in real-time and their effect may be heard immediately. Entries are made using the editing joystick by moving the graphics cursor (the highlighted point) horizontally to the desired point in the display; the attached point may then be moved vertically to the desired value. These points may also be moved by positioning the text cursor in the "X" field and specifying the point number and then entering the desired value in the "Y" field.

### Calling Waveshapes

Waveshapes already loaded into the Orchestra Library may be called by entering the desired number in the "Wshp" field as a two-digit number from 00 to 24 and pressing a "-". This waveshape will be assigned to the voice currently being used for editing without deleting the previously assigned table.

### Storing Waveshapes

Waveshapes are stored in the Orchestra Library by positioning the cursor in the waveshape number field and entering a "+" with the desired number and waveshape displayed. This will store the current display, and will overwrite any waveshape previously assigned to the same number. Waveshape Table 00 is a default table and cannot be stored.

A highlighted Waveshape Table number indicates that the table in the display has been modified since it was last called from the Orchestra Library. After storage (by typing a "+" with the cursor in this field), the number will be lit at normal intensity.

### Edit key usage

When edit mode is selected and a waveshape is being displayed, the normal polyphony algorithm is disabled, and the voice to which the waveshape is attached will be heard monophonically as is done in the instrument editor. To apply the updated waveshape to all instrument definitions which use it, store the updated waveshape in the library, exit the edit mode, and use the reset key to reload the waveshape tables for the voices.

## EDIT TUNING

MIDAS-III allows the user to assign one of 5 tuning tables in the Score Editor. This tuning table affects all 6 voices. Table 0 is the default table, consisting of a traditional 12-tone tempered scale system. Tables 1-4 may be designed by the user.

Enter the Tuning Table display from the main menu (M) by pressing the corresponding hexpad key. The table that comes up will be the one currently assigned in the Score Editor, Table 0 by default.

The column at the left of the display shows the pitch class letters of the traditional 12-tone tuning system, A - G#. Across the top are the numbers 1 through 8 indicating the octave where the pitch occurs. These row and column designations represent the input to the tuning table, and correspond to key stimuli generated in performance or called from the score. They are displaced by the number of keys indicated in the score editor transposition fields.

Note that the octave numbering system applies to an A-G# scale rather than the more traditional C-B system. C4 corresponds to middle C in the Score Editor (with no transposition).

### Editing Tuning Tables

First select the number of the table to be edited (1-4). The text cursor may be moved through the display using the 4 cursor arrows.

Tuning data is entered in the table as a letter and a three-digit number. The letter indicates the natural pitch class (A-G) of the traditional C-major diatonic scale as the point of departure.

The first digit (furthest left) indicates the octave number of the desired pitch, 0-9.

The last two digits specify the number of 32nds of a whole tone above the specified natural pitch that the desired pitch is to occur. Thus, "16" entered in this field corresponds to a semitone above, or "sharp".

For an entry to be accepted by the computer, the third digit of the field must be entered. Then the computer will "reduce" the data to the nearest natural pitch class if necessary.

Entries in the tuning table must be in the range C000 to C931. Entries outside this range will be ignored and the display will be updated to show the previous value.

Example: If you enter "B516" (read B-sharp in the fifth octave), it will be entered as "C500".

### Naming Tuning Tables

To name a tuning table, position the text cursor in the Name Field. This field consists of 12 entries that are selected from the character set that appears whenever the text cursor is in the Name Field.

Each character is selected by moving the graphic cursor (the highlighted block) to the desired character with the editing joystick; enter it into the position marked by the text cursor by pressing a "+" or a "-". The blank at the beginning of the character set is a "space" character.

### Storing Tuning Tables

To store a tuning table in the Orchestra Library, position the text cursor under the table number and press "+". Remember that the default Table 00 cannot be stored in an altered state.

Any of the 4 tuning tables stored in the Orchesta Library may be called to the display for further editing by entering its number in the Tuning Table Number field and pressing "-". If none has been stored for the number called, the default table will appear.

## LOAD and STORE - The library

"Hard" storage of user-generated data is divided into two groups:

SCORE: All data in the Score (notes and parameters)

ORCHESTRA: Instrument Definitions, Waveshape Tables, Tuning Tables

Storage is possible on cassette tape, 3.5" microdisk, or an optional 8" floppy disk.

A cassette tape can store a SCORE of up to 7148 events, or a complete ORCHESTRA.

One of the 24 available disk blocks can store a SCORE of up to 2046 events or a complete ORCHESTRA. Multiple blocks will automatically be assigned to store longer scores up to the capacity of the disk. Enough disk blocks must exist for the score to be completely stored or the operation will be ignored.

Enter the LOAD & STORE display from the main Menu (M) by pressing the corresponding hexpad key.

The "-" key initiates the LOAD process while the "+" key initiates the STORE process. Note that, in order to prevent accidental library alteration, the cursor must be positioned on the File label for a LOAD or STORE to occur, and that the "-" key is a double action key. When "-" is touched the first time, a message indicating "Load selected..." will appear. Touching the key a second time will cause the load to occur. Touching any other key while the load message is displayed will cause the load process to be aborted and the message will disappear.

Selection of options is made by touching the corresponding menu key. Touching "Disk 1" selects the 3.5" microdisk and refreseh es the directory to match its current contents. Touching "Disk 2" selects the optional 8" floppy disk and refreshes the directory to match its current contents. Touching "Tape" selects the cassette tape interface, and a blank directory will be displayed.

Before a file can be loaded or stored the disk block to be used must be selected. For load operations this is the first block of the desired file. For store operations, this is the first blank block where the file is to be stored. To enter the block number, position the text cursor in the numeric field following the label "File" and enter the 2 digit number in the range 00..23.

To load or store an orchestra, touch the "Orch" menu key. This will cause the "Orch" menu entry to be highlighted and will cause the current orchestra name to be displayed. Similarly, to load or store a score, touch the "Score" key. This will cause the "Score" menu entry to be highlighted and will cause the current score name to be displayed.

During storage, the user may assign a name to a file. This name will be displayed when a library load is completed. To assign a name, position the text cursor at the name field. A typewriter display will appear with a highlighted block showing the character that will be entered. The graphic cursor is used to position the highlighted block and the "+" or "-" keys are used to enter a character into the name field where the text cursor appears.

Loading or storage on cassette tape takes up to 120 seconds for a large score; this data will be read out in up to four sub-blocks separated by short pauses. An ORCHESTRA on cassette tape takes about 30 seconds to load or store.

Loading or storing on disk takes only a few seconds per block.

To delete a file from the disk, select the disk and the file number, as described above, and touch the "X" (delete) key. The directory will be updated and the file name about to be deleted will be highlighted. If you really want it deleted, touch "X" again. Otherwise, touch any other key to abort the delete operation. When the deletion is complete the directory display will be updated to show the current contents of the disk.

A review of "PROGRAM STORAGE" in the 400 User's Hardware Guide may be useful.

### Mixing Orchestra Libraries

When a new orchestra is loaded into the Orchestra Library, the instrument definitions assigned to voices in the score, as well as their repective assigned waveshape tables, are retained in the memory for those voices until the Front Panel RESET switch is activated. This makes it possible to replace up to six instrument definitions and/or six waveshape tables of one Orchestra Library with those of another library. To do this:

1. Assign the instrument definitions to voices in the Score Editor.

2. Load the new Orchestra Library.

3. Get the instrument definition or waveshape table numbers previously assigned in the Score Editor. They will be from the old Orchestra Library. You may change the instrument or waveshape number to put it in an empty slot or to overwrite an undesired one in the new orchestra. Then store the data in the instrument library as usual by entering "+" with the cursor in the instrument or waveshape number field.

4. Finaly, store the updated Orchestra Library with the STORE command in the main menu.

### RESET SYSTEM

The "Reset System" entry in the main menu is used to duplicate the effect of the reset key on the front panel and, in addition, to reset the jump counter events in the score. After editing a score, and before playing it, it is advisable to use the main menu "Reset System" function to reset the jump counter events so that jumps in the score will be done the correct number of times.

## INIT SYSTEM, INIT SCORE, and INIT ORCH

System, Score or Orchestra Initialization may be selected from the main Menu by pressing the corresponding hexpad keys.

"Init System" erases all user-generated data from the internal memory and resets the system to a state identical to when the MIDAS-III program first comes up.

"Init Score" erases user-generated data in the score only, and leaves the instrument library (orchestra) intact.

"Init Orch" erases user-generated data in the instrument library only, and leaves the score intact.

All of the above keys are double entry, that is, they require two activations to be effective. The first activation will cause the label in the menu to be highlighted, and the second will cause the desired action to occur. Should you accidentally activate one of the initialization keys you can clear it without having it occur by simply activating the menu key. This will cause the label to return to its normal state and will cancel selection of that function

## MAKE TAPE

A duplicate cassette tape of MIDAS-III can be made by entering "Make Tape" in the main Menu from the hexpad. This is a double entry key. The program data is sent to the "To Cassette" socket on the rear panel and takes about 3.5 minutes.

While system storage is in progress a message will appear at the bottom of the menu indicating that MIDAS-III is being stored. This message will disappear when storage is complete.

## MAKE DISK

A duplicate 3.5" microdisk copy of MIDAS-III can be made by entering "Make Disk" in the main Menu from the hexpad. This is a double entry key. A microdisk must be present in the drive for this command to execute properly.

While system storage is in progress a message will appear at the bottom of the menu indicating that MIDAS-III is being stored. This message will disappear when storage is complete.

## FINE TUNE

The "Fine Tune" menu entry allows you to specify a fixed offset which will be applied to pitches generated by the instrument. The offset is specified as a signed hexadecimal value in thirtyseconds of a tone.

To select a fine tuning value:

1. Touch the "Fine Tune" key. The "Fine Tune" label in the menu will be highlighted, indicating that the system is waiting for a new data value.

2. Select a value by touching the corresponding hex key. The result will take effect immediately. Subsequent hex key entries will continue to select new fine tuning values until the menu key ("M") is touched. The sign of the value may be changed at any time while the menu entry is highlighted by touching the "+" or "-" key, as desired.

3. Touch the "M" key to return to normal menu mode.

## SET PHASE

The "Set Phase" menu entry allows you to select a phase modulation value which will be applied to signals in the stereo output mix. Signals which are assigned to the center of stereo space will have their spectral content distributed between the left and right channels by a dome filter. The phase parameter selects the rate at which the signals will be panned between the two channels. A zero rate will remove this effect, while non-zero rates select increasing rates of panning.

To select a phase panning rate:

1. Touch the "Set Phase" key. The "Set Phase" label in the menu will be highlighted, indicating that the system is waiting for a new data value.

2. Select a value by touching the corresponding hex key. The result will take effect immediately. Subsequent hex key entries will continue to select new pan rates until the menu key is touched.

3. Touch the "M" key to return to normal menu mode.

## CRT ALIGN

The "CRT Align" function allows you to check to convergence of your color monitor. Touching the key will put a grid test pattern on the display. Touching any key will return to the main menu. Misconvergence of the CRT will show up as colr fringing of he grid lines, or misalignment of segments of the pattern.

If the test pattern shows any color misconvergence you should take appropriate steps to correct it. CRT alignment should be done by properly trained service personnel as it involves high voltage circuitry. Refer to your color monitor manual for service information.