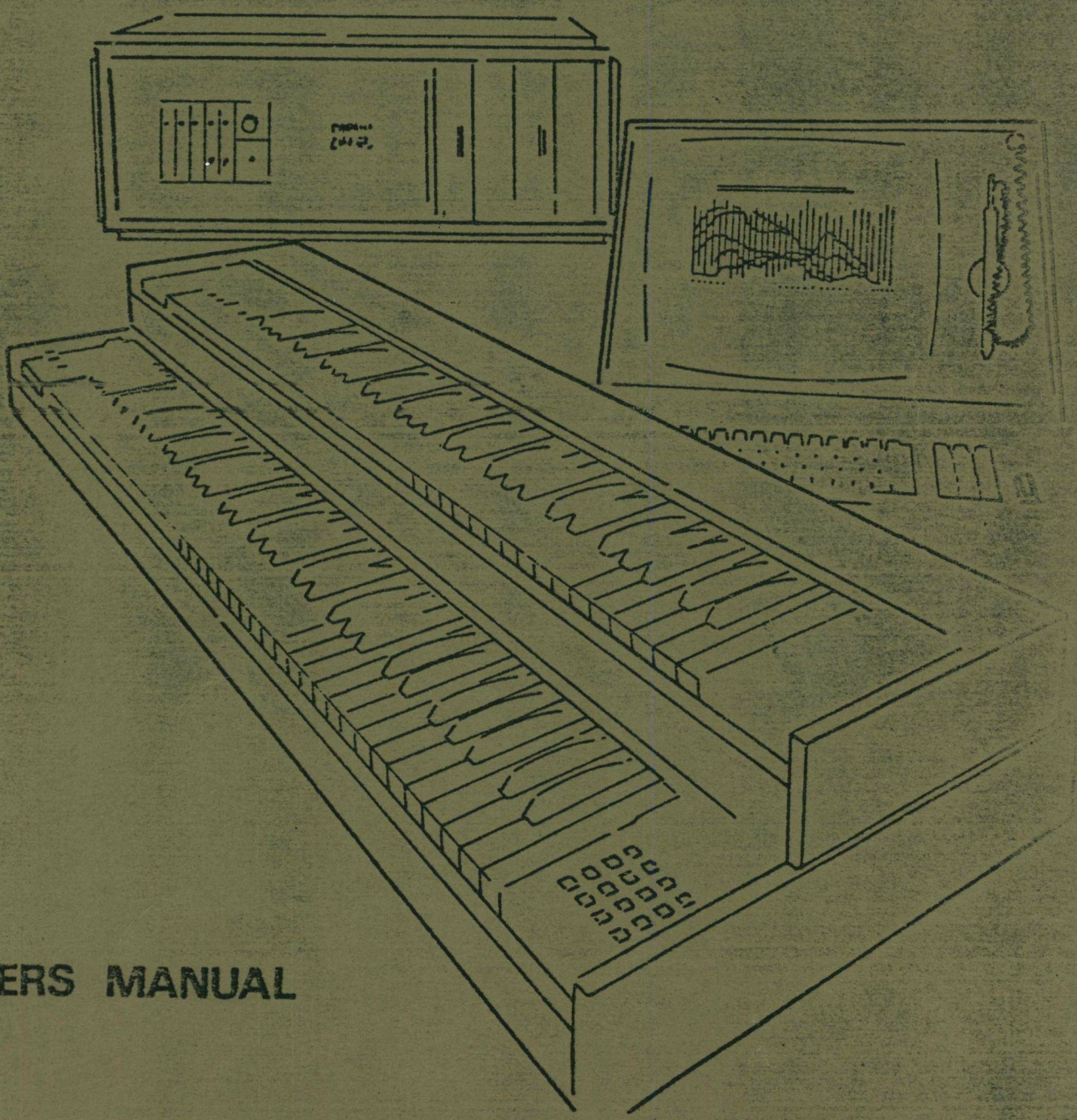


# The FAIRLIGHT

COMPUTER MUSICAL INSTRUMENT



USERS MANUAL



R!

F A I R L I G H T

- C M I -

V3 \*\* 09

OPERATION MANUAL

AUGUST 1982

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FAIRLIGHT INSTRUMENTS PTY. LTD.

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WARNING:

THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTIONS MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. AS TEMPORARILY PERMITTED BY REGULATION IT HAS NOT BEEN TESTED FOR COMPLIANCE WITH THE LIMITS FOR CLASS A COMPUTING DEVICES PURSUANT TO SUBPART J OF PART 15 OF FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.



## TABLE OF CONTENTS

	Page
*** SECTION A ***	
INTRODUCTION TO THE FAIRLIGHT .....	1
COMPUTERS in general .....	1
programs .....	1
input and output .....	2
terminals .....	2
memory .....	3
files .....	3
loading, saving, updating, deleting .....	3
THE FAIRLIGHT in general .....	5
system capabilities .....	5
FAIRLIGHT components .....	7
card cage assembly .....	7
front panel .....	7
restart & interrupt buttons .....	7
disk drives .....	7
disk insertion and care .....	8
music keyboard .....	8
terminal .....	8
alpha-numeric keyboard .....	8
lightpen .....	8
video monitor .....	9
DISPLAY page concept .....	9
INTRODUCTION to the pages .....	10
PAGE relationships .....	11
*** SECTION B ***	
OPERATING TECHNIQUES .....	12
status line .....	12
command line .....	12
use of the terminal keyboard .....	13
return key .....	13
add, sub, & set keys .....	13
cursor control keys .....	14
rubout & clear keys .....	14
repeat function .....	15
ASSIGNMENT examples .....	15
USE of the lightpen .....	16
getting a hit .....	16
light commands .....	17
cursor control .....	17
graphic controls .....	17



TABLE OF CONTENTS

\*\*\* SECTION C \*\*\*

PAGE 1 INDEX

	Page
HELP PAGE instructions .....	19
COMMAND descriptions .....	20
ASSIGNMENT descriptors .....	20
DISPLAY PAGE selection .....	21
USER NAME assignment .....	21
SYSTEM FUNCTION index .....	21
LOAD/SAVE instrument or voice files .....	22

PAGE 2 DISK CONTROL

FILENAMES and types .....	24
FREE SPACE on disk .....	24
LIBRARY number .....	24
SELECTING files (MULTI & CANCEL) .....	25
CHANGING disk, user or file names .....	25
QUERY command .....	25
SAVING instrument or voice files .....	26
LOADING instrument or voice files .....	26
LOADING voice files .....	26
LOADING sequence files .....	27
DELETE command .....	27
TRANSFER command .....	28
DELETE/OVERWRITE protection .....	28
KEYPAD on master keyboard .....	29
COMMAND SHORTCUTS .....	29



TABLE OF CONTENTS

PAGE3 KEYBOARD CONTROL

	Page
REGISTER control .....	31
NPHONY of a register .....	31
TUNING of a register .....	32
NAME/MODE of a voice .....	32
KEYBOARD control .....	33
SELECTION of a keyboard number .....	33
MAPPING of registers to the keyboards .....	33
PITCH/SCALE tuning controls .....	34
VOICE files .....	34
LOAD voice command .....	35
SAVE voice command .....	35
MULTI-VOICE load command .....	36
CREATE voice command .....	36
INSTRUMENT files .....	37
LOAD instrument command .....	37
SAVE instrument command .....	37
PROTECTION against overwriting your files .....	38
OPTIONS to use with the SAVE command .....	38

PAGE 4 HARMONIC ENVELOPES

PROFILE graph .....	40
HARMONIC amplitude profiles .....	40
DURATION profile .....	41
ENERGY profile .....	41
DELETE/ZERO command .....	42
COMPUTE command .....	42
INTERP switch .....	43
SCALE command .....	43
JOIN/PLOT selector .....	43
LOOP control .....	44
CLEAR command .....	44
RESET command .....	44
VOICE selection .....	45
LOADING/SAVING files .....	45
WAVEFORM memory .....	45
MODE of a voice .....	46

TABLE OF CONTENTS

PAGE 5 WAVEFORM GENERATION

	Page
HARMONIC amplitude faders .....	48
CURRENT segment selection .....	48
ZERO all harmonic faders .....	48
FILL other segments .....	49
COMPUTE waveform .....	49
SELECT any loaded voice .....	50
LOAD/SAVE instrument and voice files .....	50

PAGE 6 WAVEFORM DRAWING

WAVEFORM GRAPH .....	52
CURRENT SEGMENT assignment .....	52
DISPLAY command .....	53
START/STOP stepping display .....	53
LIGHTPEN waveform modification .....	54
POINT/LEVEL waveform modification .....	54
JOIN/PLOT switch .....	54
ZERO command .....	55
INVERT command .....	55
TRADITIONAL waveform generation .....	55
FILL command .....	56
GAIN command .....	56
MERGE command .....	57
MIX command .....	57
ROTATE command .....	58
REFLECT command .....	59
REVERSE command .....	59
TRANSFER command .....	59
ADD command .....	60
VOICE selection .....	60
LOAD/SAVE instrument and voice files .....	61

TABLE OF CONTENTS

PAGE 9 KEYBOARD SEQUENCER

	Page
INTRODUCTION to KEYBOARD SEQUENCER .....	79
FREE SPACE on disk .....	80
ASSIGN record & replay files .....	80
RECORD command .....	80
STOP command .....	81
REPLAY command .....	81
MERGE command .....	82
OVERWRITE protection .....	82
TRIM replay file .....	82
CONTROL/SWITCHES recorded or replayed .....	83
KEYBOARD selection .....	83
INPUT STREAM to keyboard number table .....	84
SPEED control .....	84
SYNC selection: internal or external .....	85
CLICK control .....	85

PAGE D WAVEFORM DISPLAY

VOICE WAVEFORM display .....	88
FORMATTING selectors .....	88
DISPLAY waveform .....	89
SELECT any loaded VOICE .....	89
LOAD/SAVE Instrument or Voice files .....	89

PAGE L DISK LIBRARY

DISK LIBRARY .....	91
BUILD the library .....	91
READ a disk into library .....	92
FIND files in library .....	92
EXAMPLES of FIND command .....	93



TABLE OF CONTENTS

PAGE 7 CONTROL PARAMETERS

	Page
CONTROL PARAMETERS .....	63
CONTROLS/SWITCHES on keyboard .....	63
KEY-VELOCITY function .....	64
ASSIGN to CONTROL parameters .....	64
CONTROL filename .....	64
LINK CONTROL file to VOICE .....	65
SAVE/LOAD CONTROL file .....	65
QUICK REFERENCE for ranges & patches .....	66
MODE .....	66
LEVEL/FILTER .....	67
DAMPING/ATTACK .....	67
GLISSANDO/PORTAMENTO .....	69
VIBRATO .....	69
LOOP .....	69
START/SLUR .....	70
SUSTAIN .....	70
SELECT any loaded VOICE .....	71
RESET all CONTROL parameters .....	71

PAGE 8 SOUND SAMPLING

SOUND SAMPLING .....	73
SAMPLE RATE .....	73
FILTER LOW/HIGH .....	74
SAMPLE LEVEL .....	74
TRIGGER LEVEL .....	75
TRIGGER DELAY .....	75
SAMPLE EXTERNAL SIGNAL .....	75
DISPLAY AMPLITUDE .....	76
TABLE of SAMPLE RATES .....	76
SELECT any loaded VOICE .....	76
LOAD/SAVE INSTRUMENT and VOICE files .....	77



TABLE OF CONTENTS

*** SECTION D ***	Page
INSTALLATION AND EXTERNAL CONNECTIONS .....	94
mains voltage and frequency .....	94
monitor connections .....	94
music keyboard .....	94
pedal inputs .....	94
printer .....	95
AUDIO CONNECTIONS .....	95
phones .....	95
monitor .....	95
channel outputs 1-8 .....	96
mixed line output .....	96
sync .....	96
filter output .....	96
mic in .....	97
line in .....	97
adc direct .....	97



## - SECTION A -

INTRODUCTION TO THE FAIRLIGHT

THE FAIRLIGHT CMI represents an exponential leap in the harnessing of modern technology to the creative needs of modern musicians and composers. It is a multiple processor micro-computer system configured as an octophonic audio synthesizer; a Computer Music Instrument which expands dramatically the possibilities and practicalities of electronic music composition and performance through an extensive and powerful range of functions.

The capabilities of the FAIRLIGHT place it in a virtually unpopulated region between the analog or hybrid keyboard synthesizers which have become firmly established in many modern musical forms over the last decade, and the large scale computer music systems usually found only in leading academic institutions. Maintaining or improving the undeniable musical immediacy of the former in a portable, cost-effective package providing some of the computer power of the latter has been the primary design objective for the system.

As you explore the FAIRLIGHT you will notice that both familiar and unfamiliar synthesis techniques have been presented in a control format previously unexploited in an instrument of this size and price range. Coming to terms with all aspects of the system's use may possibly require the re-evaluation of some old habits and concepts. It will certainly require the acquisition of some new ones. Musicians who have come to think of audio modulation processes in terms of the names or appearances of voltage-controlled modules will need to develop a more absolute knowledge of what those processes mean in terms of actual waveshape and spectral content. Conveniently though, it would be difficult to imagine a more comprehensive means for a systematic self-education in audio physics than the FAIRLIGHT CMI.

COMPUTERS IN GENERAL

While it is true that no formal knowledge of computers or programming is required for operation, a few fundamental concepts must be discussed before an exploration of the FAIRLIGHT can begin.

PROGRAMS

Like an amplifier, a computer requires input and generates output. Unlike an amplifier, with one function (amplification), a computer has many functions which are selected and implemented by specific instructions. These instructions are represented by numbers and are strung together in meaningful sequences called PROGRAMS. By changing only the program, a computer can be made to control a missile guidance system, or handle the accounting and inventory for a supermarket, or play a game of chess. It is the coupling of this inherently limitless range of applications with the extreme miniturization achieved in the last few years that is the impetus behind the continuing emergence of new computer-based products for every imaginable profession and hobby.

In the development of these products, the creation of the program is typically the most difficult and time-consuming part of the exercise and is performed by specialists known as PROGRAMMERS. In the case of the FAIRLIGHT, and in most other computer applications, the person who finally makes use of the product is not involved with any actual computer programming. The person is USING a program.

#### INPUT AND OUTPUT

The input and output for a computer can take form as widely varied as the applications. Here are a few examples...

<u>application</u>	<u>input</u>	<u>output</u>
MISSILE GUIDANCE	inertia sensors on board missile	control signals to rocket engines
SUPERMARKET ACCOUNTS	transactions from cash registers	automatic reordering of stock
CHESS GAME	your move	its move
FAIRLIGHT	music keyboard playing	music

From the computer's point of view, all input and output is actually numeric; from the programs come the purpose and organisation which gives meaning to the numbers.

#### TERMINALS

Communication between human and computer is provided by what is known as a TERMINAL; of which the most common form is the now familiar video screen and typewriter-style keyboard seen at airline ticket counters, banks, pinball arcades, etc. The keyboard is an input device, and the video screen is an output device.

What is actually typed on the keyboard and displayed on the screen is very much a function of the application but can always be divided into certain categories. Computer video output is said to be either ALPHA-NUMERIC (consisting of letters and numbers) or GRAPHIC (bar and line graphs or pictorial representations). The FAIRLIGHT video system uses both.

Since the keyboard is like a typewriter, and therefore provides primarily letters and numbers, it is known as an ALPHA-NUMERIC KEYBOARD. Punctuation is also provided along with a few special function keys. The categorization of keyboard input is based on the PURPOSE of what is typed and what falls into two basic areas: COMMANDS and ASSIGNMENTS.

A command causes a specific ACTION to take place, whereas an assignment allocates a VALUE to a VARIABLE FUNCTION. Within the FAIRLIGHT system, for example, there is a command to LOAD a sound, and a value of 200 ms may be ASSIGNED to ATTACK TIME.

MEMORY

Computers have MEMORY, and without bogging down in technicalities, it can be divided into VOLATILE and NON-VOLATILE memory. This has nothing to do with it exploding, but refers to what happens when the power is shut off. Volatile memory is not permanent and loses its contents when the power is removed, whereas non-volatile memory is essentially permanent.

Known as RANDOM ACCESS MEMORY (RAM), a computer system's volatile memory can be thought of as a huge room full of tiny post office boxes, each of which can hold a single number. As in a post office, each box also has a number which uniquely identifies it and is known as its ADDRESS. These boxes are called BYTES and the size of a computer's memory is usually given in KILOBYTES (K), or thousands of bytes. The FAIRLIGHT computer contains 64K of RAM, with each of the eight output channels having an additional 16K. The video board has another 16K, which gives a total of 208k of RAM in the system.

RAM forms a workspace, or scratchpad for the computer as well as holding the program itself while it is running. In the FAIRLIGHT, an audio waveform is held as a sequence of numbers in 16 384 bytes of memory. Each number represents the voltage level of a tiny slice of the waveform and when converted to a real voltage in rapid succession the waveform is produced at the audio output. (This is the essence of DIGITAL audio.)

Non-volatile memory has many forms within the industry, but the one which concerns us regarding the FAIRLIGHT is the FLOPPY DISK, which is like a cross between a 45rpm record and magnetic tape. A similar principle to audio recording is used to record information (numbers) in magnetic form on the disk. The FAIRLIGHT has two DISK DRIVES. The lefthand drive is loaded with the SYSTEM DISK which holds the set of programs which comprise the FAIRLIGHT SOFTWARE PACKAGE. (Programs are known as software as opposed to hardware which refers to the physical components of a computer system.) The righthand drive provides mass storage for your sounds, sequences, 'patches', etc. The capacity of each disk is over half a million bytes.

FILES

Information is stored on disk as a system of FILES. Each file has a NAME that is given to it when the file is created. These names are chosen by the person using the computer and provide a more efficient means of identifying and selecting the information than simply using a number or disk location. Files are LOADED, SAVED, DELETED, COPIED, etc., by reference to their names. A file name also has a SUFFIX which identifies the type of file.

LOADING, SAVING, UPDATING, DELETING

The terms LOADING, SAVING and UPDATING refer to the transfer of information (files) between volatile and non-volatile memory. The action of moving a file from disk (non-volatile) to RAM (volatile) is called LOADING; moving information from RAM to a disk file is called SAVING.



When saving, the action of overwriting an existing disk file with new or different information is termed UPDATING, and results in the loss of the previous information.

When information (such as a waveform) is held in RAM but has not been explicitly SAVED, it is termed UN-SAVED and will be lost if the power is cut.

To DELETE a file is to permanently eliminate it from the disk. The disk space which was previously occupied by the deleted file is returned for re-use.

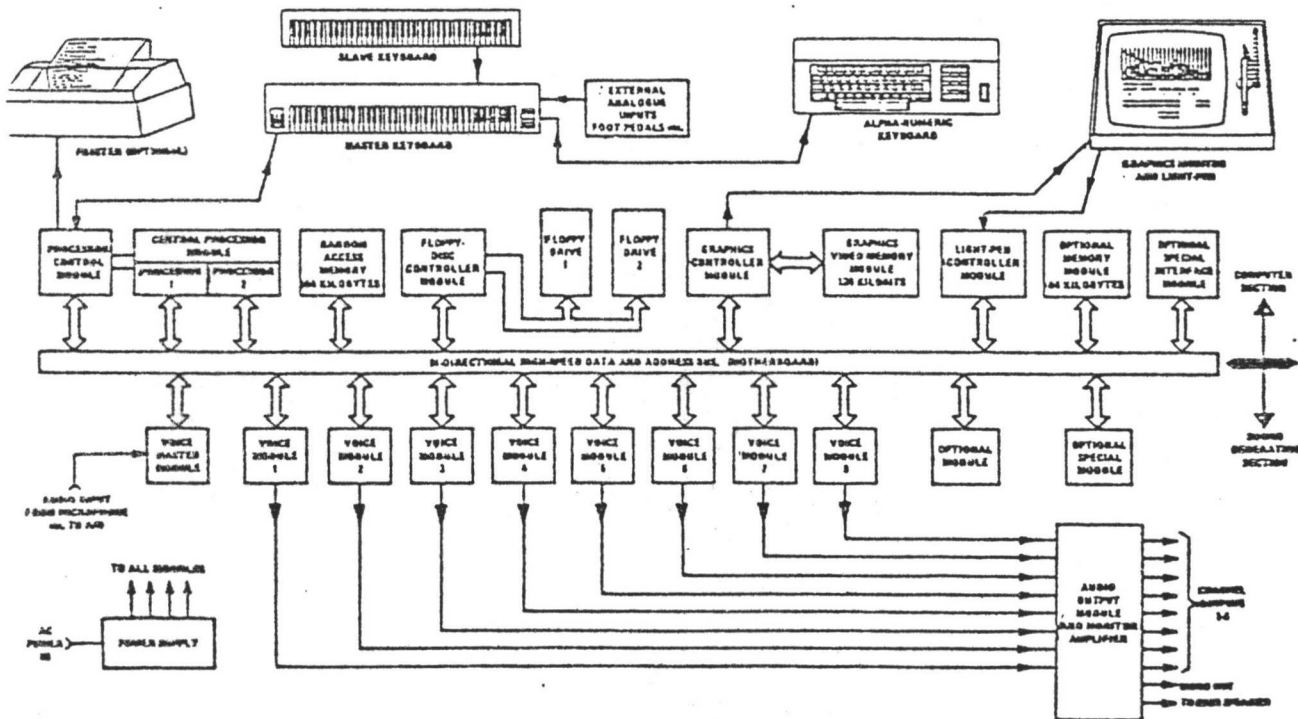


FIGURE 1  
SYSTEM BLOCK DIAGRAM

[Figure A] SYSTEM BLOCK DIAGRAM

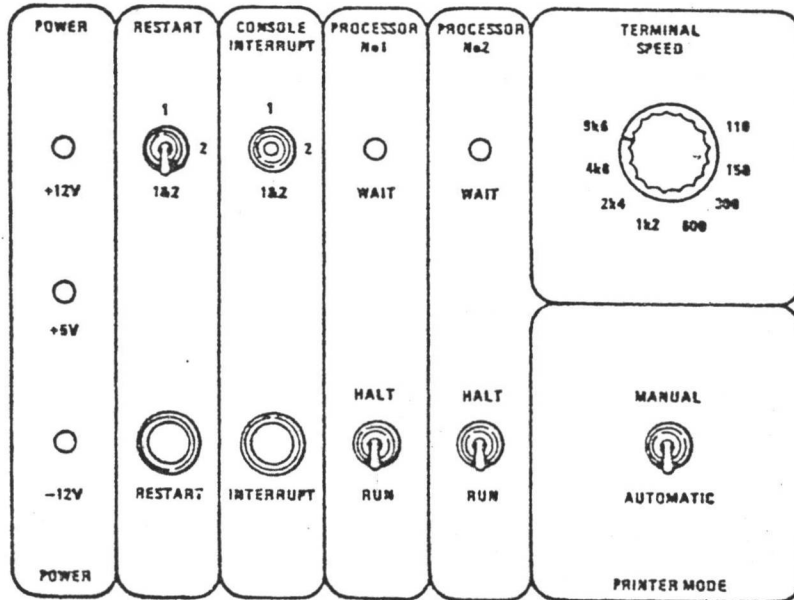
## THE FAIRLIGHT IN GENERAL

The design of the FAIRLIGHT represents a total departure from the traditional construction and appearance of electronic keyboard instruments. The employment of DIGITAL techniques for sound synthesis makes it impossible to describe its capabilities in terms of a VCO-VCA-VCF count since there is not one audio oscillator in the entire system. Sounds are created and modified in digital form and are converted to an analog signal at the output stage for conventional amplification or recording. This allows some rather unique facilities.

SYSTEM CAPABILITIES

Here is a synopsis of the FAIRLIGHT's basic functions.

- \* The creation and/or modification of complex DYNAMIC TIMBRES is possible by any one or a combination of three methods:
  - > Additive harmonic synthesis through designation of AMPLITUDE/TIME CONTOURS for each of up to 32 harmonics
  - > Direct waveshape determination by literally DRAWING AUDIO WAVEFORMS on the video monitor using the lightpen.
  - > SAMPLING of an EXTERNAL AUDIO SIGNAL by analog to digital conversion techniques for use as a sound source.
  
- \* The 6-octave music KEYBOARD(s), featuring KEY VELOCITY SENSITIVITY, may be configured as a number of REGISTERS with a different sound or group of sounds assigned to each register. Up to eight different sounds can be simultaneously allocated over the keyboard(s) in this fashion.
  
- \* Additional REAL TIME EXPRESSION is provided by FADER, PUSH-BUTTON, and optional FOOTPEDAL controllers with variable functions.
  
- \* A powerful EIGHT-VOICE SEQUENCER which is programmed from the music keyboard.
  
- \* DUAL DOUBLE-SIDED FLOPPY DISKS provide rapid access mass memory. Distinct families of information are generated and can be LOADED or SAVED individually:
  - > VOICE ( a single 'sound')
  - > CONTROL ('patching' and setting of special effects relating to a voice)
  - > INSTRUMENT (total state of the system: which voices are loaded; how they are assigned to the keyboard; any tuning or special effects)
  - > SEQUENCE (keyboard data for sequence replay)



[FIGURE B] FRONT PANEL



FAIRLIGHT COMPONENTS

Inspection of the FAIRLIGHT's basic physical units will show their relation to the use of the system as a whole.

CARD CAGE ASSEMBLY

This houses the power supply, the central computer, the two disk drives, inter-faces for the video monitor and optional printer, plus the eight voice modules, voice master module, audio output module, and 20 watt monitor amplifier. All input, output, and intra-system connections are made at the back of the CARD CAGE (Section D).

FRONT PANEL

This small collection of switches and lights is known as the FRONT PANEL and relates to the correct operation of the computer. The positions of all switches must be as shown (see Figure B).

The three yellow lights indicate that the power is on and should always be illuminated (check fuses if not). The two red lights indicate that the central processors are halted, and should NEVER be illuminated (check the switches if they are). There is one exception to this: use of the external sampling function will illuminate the second red light momentarily.

RESTART & INTERRUPT BUTTONS

Ordinarily these buttons are never used. Neither can do any real damage, except to whatever un-saved work you might be holding in the system (which may be lost).

The INTERRUPT button is used only for system diagnosis and testing procedures and then only under direct instruction from a diagnostic centre.

The RESTART button does exactly what it says: the whole instrument is initialised as if the system disk had just been placed in the system drive after power-up. Therefore, it can be used if you wish to CLEAR EVERYTHING and start fresh.

If the FAIRLIGHT should ever appear to be malfunctioning (will not respond at all, or exhibits some aberrant symptom), first WRITE DOWN the exact nature of the problem along with details of what you were doing when it occurred and any messages that were printed in the top line of the display. This procedure will enable a remote diagnosis to be made. You will then have to press the RESTART button. If the suspected fault persists, try removing your disks and switch off all power to the system for about fifteen seconds, then start it up again. If the fault still persists, contact your FAIRLIGHT distributor.

DISK DRIVES

These are the 'record-replay' units for the 8" floppy disks which form the mass memory system for the FAIRLIGHT. They are not audio devices, but provide for the rapid storage and retrieval of digital data.

The disks should ONLY be inserted when the system has already been switched and the power should NEVER be switched OFF until the disks have been removed.

If this rule is ignored the data on your disks may be damaged. Only the SYSTEM DISK should ever be placed in the lefthand drive. The righthand drive is exclusively for your file disks.

#### DISK INSERTION AND CARE

When inserting a disk, take care to gently push the the disk into the drive until it seats with a click. The drive door is then carefully but firmly snapped shut. If the disk is not fully inserted it will be caught and possibly damaged by the door. The disk must ALWAYS be inserted with the orientation shown in Figure C (label vertical, facing right from the 'near' edge of the disk).

To remove a disk, press the release catch on the left side of the door and the disk will pop out for removal. The red light on each drive is illuminated when the computer is using the disk. DO NOT open the door when the red light is on or blinking intermittently; wait until the computer is finished.

Always store the disks IN THEIR JACKETS and treat them as you would any valuable recording - away from heat, dust, and strong magnetic fields (loudspeakers, telephones, headphones, etc). When labelling your disks (a very good idea) do not use a writing implement which can cause a dent or depression in the disk. A felt pen is best.

#### MUSIC KEYBOARD

The MASTER keyboard and optional SLAVE keyboard are 73-key standard gauge music keyboards featuring a fully moulded key design. The MASTER keyboard has its own internal micro-computer which handles the collection and transmission of keying data to the central computer. The velocity of each keystroke is detected and may be used to control level or attack or both.

The MASTER keyboard includes three faders, two switches, and sockets for the optional FOOT PEDAL switches. These are used to control level or attack or both.

The MASTER keyboard also incorporates a small 16-key calculator-type keypad with a LED display which may be used to load sounds from the keyboard with a minimum of effort. This would typically be used for convenience in a live performance situation.

#### THE TERMINAL

The terminal is actually comprised of three units: the ALPHA-NUMERIC KEYBOARD, LIGHTPEN, and VIDEO MONITOR.

##### ALPHA-NUMERIC KEYBOARD

This is a 62 key typewriter-style keyboard used for entering COMMANDS and ASSIGNMENTS to the system. A separate pad to the right of the keyboard contains the ADD, SUB, and CURSOR CONTROL keys used in making assignments (section B). Also referred to as the TERMINAL KEYBOARD.

##### LIGHTPEN

This pen-sized, light-sensitive device provides two distinctly different functions in relation to the video monitor: SELECTION and PLOTTING.

In selection, the lightpen is used to choose a single item from a list of items presented on the screen by pointing the pen at the desired item.

In plotting, the lightpen is used to DRAW waveforms or time contours directly on the monitor screen in graphic form. The system function controlled by such a graph defines its meaning, but the use of the pen is consistent and will rapidly become second nature (section B).

#### VIDEO MONITOR

The VIDEO MONITOR is a 14" high resolution, green phosphor display device which is used to present the different control facilities of the system to the musician. Technically, this is an output device. In combination with the lightpen and alpha-numeric keyboard, however, the screen becomes TWO-WAY; displaying the information which you input to the system along with information which the system outputs to you.

#### THE DISPLAY PAGE CONCEPT

The various functions of the FAIRLIGHT have been grouped into various categories, which are characterised by different display formats. These display formats, or more exactly, the individual collections of operations they represent, are called DISPLAY PAGES and they are referred to by number or letter:

PAGE 1)	INDEX
PAGE 2)	DISK CONTROL
PAGE 3)	KEYBOARD CONTROL
PAGE 4)	HARMONIC PROFILES
PAGE 5)	HARMONIC AMPLITUDE FADERS
PAGE 6)	WAVEFORM DRAWING
PAGE 7)	CONTROL PARAMETERS
PAGE 8)	SOUND SAMPLING
PAGE 9)	KEYBOARD SEQUENCER
PAGE D)	VOICE WAVEFORM DISPLAY
PAGE L)	DISK LIBRARY

INTRODUCTION TO THE PAGES

PAGE 1 (INDEX) is like a table of contents, or menu, and the selection of the other pages is its function.

PAGE 2 (DISK CONTROL) provides a DIRECTORY of all files on the currently loaded file disk along with commands to load, save, copy, delete, and rename files. By using only PAGE 2, you may load and play any sound in your disk library.

PAGE 3 (KEYBOARD control) provides for the allocation of output channels to the VOICE REGISTERS and assignments of REGISTERS to the music keyboard(s). All of the system's tuning controls are also found on PAGE 3.

PAGE 4 (HARMONIC PROFILES) and PAGE 5 (HARMONIC AMPLITUDE FADERS) both offer facilities for additive synthesis by harmonic amplitude manipulation.

PAGE 6 (WAVEFORM DRAWING) allows the drawing of audio waveforms using the LIGHTPEN. This is a process which the author of this manual has come to think of as animating sound (like animating film).

PAGE 7 (CONTROL PARAMETERS) provides the 'patching' and setting of expressive control parameters such as attack, level, vibrato, portamento and so on.

PAGE 8 (SOUND SAMPLING) allows an external audio signal to be digitized and stored for use as a sound source. Once sampled in this way, many of the functions provided on other pages may be used to modify the resultant waveform.

PAGE 9 (KEYBOARD SEQUENCER) is a keyboard programmable sequencer. Keying data is stored as a disk file and may be repeatedly MERGED with successive keyboard performances much like overdubbing with audio tape.

PAGE D (VOICE WAVEFORM DISPLAY) shows the entire contents of waveform memory of any voice in various convenient formats.

PAGE L (DISK LIBRARY) organises and cross references all sound disk file types.

Thus the design of the FAIRLIGHT is fundamentally linked to the video monitor. The concept of display pages is therefore extremely important in gaining a solid grasp of the system's potential, and can be thought of as a window which one moves in order to view and gain access to different areas of control within the instrument.

PAGE RELATIONSHIPS

PAGES 1, 8, 9, D, and L are functionally passive in that they play no part in the system's operation unless they are actually being displayed. PAGES 2-7, however, relate to functions which are effectively active at all times, irrespective of the page displayed:

PAGE 2 (DISK CONTROL) maintains continuous supervision of all disk activities and will not allow you to accidentally overwrite certain files, use duplicate file names, etc.

PAGE 3 (KEYBOARD CONTROL) is also a utility page and performs allocation, routing, and tuning functions that apply to the instrument at all times. It is therefore termed an INSTRUMENT-RELATED page and its entire configuration can be saved or loaded as an INSTRUMENT FILE.

PAGE 4 (HARMONIC PROFILES), PAGE 5 (WAVEFORM GENERATION) and PAGE 6 (WAVEFORM DRAWING) form the heart of the FAIRLIGHT and provide three different approaches to waveform creation, modification, and control.

PAGE 7 (CONTROL PARAMETERS) supports additional functions applying to the actual playing of a waveform.

The selection of these pages does therefore NOT result in the ACTIVATION of their functions, but rather in OPENING a path of CONTROL so that inspection or modification may be performed.

In addition to PAGES 4-6, PAGE 8 (SOUND ANALYSIS) also provides for the creation of a waveform with its external sampling function. We therefore have five pages, 4-8, whose functions may be combined to define a particular sound, or as we call it - VOICE. These are the VOICE-RELATED pages.

Since the FAIRLIGHT can have up to eight voices active simultaneously, there is always a 'copy' of each of these voice-related pages for however many voices are active, each may be independently selected for inspection or modification by PAGES 4-8.

The interaction of the display pages is not exactly simple at first glance, but a fairly solid understanding should be gained after only a few days use. Once some familiarity is acquired, you will find yourself flitting from page to page, progressively honing a sound to your satisfaction by using all of the facilities provided.

## - SECTION B -

OPERATING TECHNIQUES

From this point, exploration of the FAIRLIGHT's capabilities becomes the exploration of the display pages themselves, but first we must consider the basic techniques of using the pages within the terminal system as a whole. The operation of the lightpen and terminal keyboard in association with the display page features will be best illustrated by direct examples, so it is now assumed that you have the FAIRLIGHT up and running before you.

THE STATUS LINE

When the system is first switched on, and a system disk inserted in the left hand disk drive, PAGE 1 is displayed, and there is a message at the top of the screen:

```
** PAGE 1 - READY **
```

The horizontal band (line) which is occupied by this greeting is called the STATUS LINE and its function is to display messages from the FAIRLIGHT to you. If you make an incorrect entry from the terminal, an ERROR MESSAGE will be printed to notify you. Whenever your input does not result in the expected action, check the status line, and you may find a message waiting.

In certain operations (such as deleting files, overwriting some file types, etc.) a safeguard question will be printed in the STATUS LINE to give you the option of proceeding or aborting the action. When deleting a file, for example, the message:

```
DELETE (filename) Y/N ??
```

will be displayed. Typing anything but a 'Y <return>' will abort the deletion.

THE COMMAND LINE

The line directly below the status line is known as the command line. Anything typed will appear immediately to the right of the word COMMAND so that you may see what you have typed before putting it into action.



USE OF THE TERMINAL KEYBOARD

As we have seen, input from the terminal keyboard can be either a COMMAND or an ASSIGNMENT. In either case, after typing the required input into the command line, one of the TERMINATOR KEYS must be pressed. It is the terminator which indicates whether a command or assignment is being made, and causes the required action to take place.

RETURN KEY

The form and use of a modern video terminal system has evolved from the teletype terminal used in earlier computer systems. This has in turn evolved from the typewriter. The CARRIAGE RETURN function of a typewriter (which TERMINATES a line of text) has been retained, and has developed into a standard COMMAND TERMINATOR in computer systems.

Either of the two keys marked 'RETURN' must be pressed as the last key in any COMMAND. The RETURN key causes the FAIRLIGHT to test the contents of the command line for one of the commands supported by the currently selected display page. If a valid command is found it is executed and the command line is CLEARED. If the SYNTAX (format) of the input is incorrect, an ERROR MESSAGE may be displayed in the status line and the command line may remain UNCLEARED.

The most commonly used command is the one to change display pages and is known as the PAGE command. To select any page type:

Pn<return>

where 'n' is the number of the page (1-9) and <return> is the command terminator.

(This system of specifying input syntax with lower case letters representing an unknown which you supply, and brackets ("< >") to indicate terminator or special function keys will be used throughout this manual.)

Provided a SOUNDS DISK has been inserted into the right hand disk drive, we may use the LOAD (voice) command to get some sound! First select PAGE 2 (DISK CONTROL) with the PAGE command. The names of all files on the disk will be displayed. Pick a VOICE FILE ('.VC' suffix) and type:

L,A,filename<return>

where 'filename' is the name of the VOICE (excluding the .VC suffix). If the necessary audio connections have been made (section D) the music keyboard should now be active. Try a few voices and have a look at the various pages.

ADD, SUB, & SET KEYS

To TERMINATE the ASSIGNMENT of a value to a VARIABLE function, three ASSIGNMENT TERMINATOR KEYS have been provided. These are marked 'SUB', 'ADD', and 'SET'.

FAIRLIGHT variables will accept either NUMERIC or ALPHABETIC assignments depending on the function concerned. Numeric variables require NUMBERS; alphabetic variables require LETTERS.

## Examples of NUMERIC VARIABLES:

MASTER PITCH	- PAGE 3 -	0 - 255
SAMPLE RATE	- PAGE 8 -	2100 - 30200 Hz
SPEED	- PAGE 9 -	1000 - 65535

## Examples of ALPHABETIC VARIABLES:

DISK ID	- PAGE 2 -	8 character name
SUSTAIN	- PAGE 7 -	ON or OFF
SYNC	- PAGE 9 -	INT or EXT

PAGE 7 (CONTROL PARAMETERS) contains several special variables which accept BOTH alphabetic and numeric assignment.

The SET KEY is used to terminate input for assignment to EITHER variable type, and causes a direct replacement of the current value with the input value.

The ADD and SUB keys are used to terminate NUMERIC assignments ONLY and cause the arithmetic ADDITION or SUBTRACTION of the typed input against the current value of the variable.

Assignments do NOT cause the command line to be cleared so that by typing, for example, '10', the ADD or SUB keys may be repeatedly pressed to 'wind' a parameter up or down.

CURSOR CONTROL KEYS

Since some pages support several variables, we must be able to select a particular one as the object of an assignment. This is performed through positional control of the ASSIGNMENT CURSOR.

The CURSOR CONTROL KEYS consist of the four keys marked with ARROWS, plus the key marked 'HOME', situated in the small pad on the right of the terminal keyboard.

For a picture that's worth a thousand words, select PAGE 7 (CONTROL PARAMETERS) with the PAGE command. This page contain several variables. Press the 'down-arrow' repeatedly and then some of the other 'arrow' keys. Observe how the CURSOR moves around.

The HOME KEY, marked 'HOME', will cause the cursor to return to the command line. All pages utilize this system of cursor control.

RUBOUT & CLEAR KEYS

The key marked 'RUBOUT' causes the deletion, or 'erasure', of the LAST CHARACTER in the command line. If a typing mistake is made, RUBOUT is used to 'backup' and re-type the correct input.

The key marked 'CLEAR' causes the command line to be cleared. Note that once an assignment or syntax error has been made the line will automatically clear on the next keystroke.

REPEAT FUNCTION

The facility is provided to rapidly repeat the LAST KEY TYPED. This is done by HOLDING DOWN the key marked 'CTRL' (called the CONTROL KEY), and pressing 'R'. Whatever key was last used will be repeatedly transmitted until this CONTROL-R combination is released. The key which is repeated can be any key on the terminal keyboard giving this function a wide application. It is for your convenience, wherever you can apply it.

For example, consider repeating the RUBOUT key to erase the last half of the command line; or the ADD key to 'wind up' the value of a variable.

ASSIGNMENT EXAMPLES

Now we may explore the combined use of these features in making NUMERIC or ALPHABETIC ASSIGNMENTS from the terminal keyboard.

Select PAGE 8 (SOUND SAMPLING) with the PAGE command, then use the cursor control keys to TAB to SAMPLE RATE. (This is the rate, in Hertz, at which an external signal is SAMPLED from this page; but we won't do any sampling - just try a few assignments.) Note that SAMPLE RATE is already set to 14 080 Hz. This is the DEFAULT setting, meaning that it will always be set to this unless you change it. Now type:

24000<set>

The SAMPLE RATE is now 24 000Hz. Press RUBOUT four times to delete all but the '2' from the command line. Now press SUB. Note that 2 has been subtracted from 24 000 to yield a rate of 23 998Hz.

If you now use the REPEAT function <ctrl>R as described, the rate will be 'wound-down' in steps of 2. Got the idea?

Assuming you have a VOICE loaded we can try a variable with an audible function by selecting PAGE 7 (CONTROL PARAMETERS). Press the 'down-arrow' until the cursor is on 'LEVEL'. LEVEL controls the volume and is an example of a variable which will accept BOTH alphabetic and numeric assignments.

SET LEVEL to 255 (type: 255<set> ). This represents maximum level. Typing <sub> will now subtract 255 which will set LEVEL to 0, or no level at all. Now type: 1<add> . Use <ctrl>R to REPEAT the addition and you will hear the volume gradually increase.

ALPHABETIC assignments are performed in exactly the same fashion, except the SUB and ADD keys are meaningless.

Type:

KEYVEL<set>

This is the name of the KEY VELOCITY function and can be assigned to LEVEL which causes the keyboard to be touch sensitive.

Type:

CNTRL1<set>

This is the name of the first FADER on the master music keyboard which will now control LEVEL.

### USE OF THE LIGHTPEN

Having gained an understanding of the basic principles of making commands and assignments, we may incorporate the various functions of the LIGHTPEN.

### GETTING A HIT

The LIGHTPEN is light sensitive and operates by detecting the light from the video image. From this the system can determine the position of the pen and thereby identify the feature to which it is pointing.

Select PAGE 1 (INDEX). Grasp the lightpen as if you were going to write with it, being careful not to touch the 'head' which is insulated from the body of the pen by a black plastic ring. Now point the lightpen at the word 'AUSTRALIA', holding the tip at right-angles against the surface of the screen.

Note the 'blob' of light which appears directly beneath the tip. Touch the head of the pen with your index finger and the 'blob' of light should dissappear. If it doesn't, vary the angle and proximity of the pen to the screen until you can consistently cause the blob to appear and disappear at will.

This combined action of pointing the lightpen at a page feature and momentarily touching the head is known as a "hit". Providing the feature is a lightpen-activated function (AUSTRALIA is not) the hit will initiate the selected action.

Specifically, the pen should be positioned so that the left edge of the 'blob' of light just contacts the right edge of the target feature. A hit is then made by a single, positive, momentary contact with the index finger.

Lightpen-activated functions are divided into COMMANDS, CURSOR CONTROL and GRAPHIC CONTROLS.

LIGHT COMMANDS

Many commands can be given by lightpen and are referred to as LIGHT COMMANDS. Pages supporting light commands feature a list of COMMAND NAMES which are activated by "hitting" the required name with the lightpen.

On PAGE 1 (INDEX), the PAGE command is available as a light command and is given by hitting the name or number of the desired page. Use the lightpen to select PAGE 7 (CONTROL PARAMETERS).

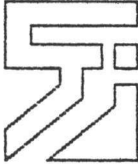
CURSOR CONTROL

The lightpen can also be used like the cursor control keys to position the assignment cursor for variable assignment. To do this, the space occupied by the VALUE is hit; not the variable itself. Select LEVEL for assignment by hitting its current value. Once the cursor has been positioned in this manner, assignment can take place via the terminal keyboard and the ADD, SUB and SET keys.

GRAPHIC CONTROLS

Several pages support special purpose lightpen functions such as the KEYBOARD MAP on PAGE 3, the HARMONIC PROFILES on PAGE 4, the HARMONIC FADERS on PAGE 5 and the WAVEFORM DRAWING on PAGE 6. These features cannot be demonstrated properly without entering into the finer points of individual page use. They will therefore be covered in the next section. The "hit" action is identical in all sections.

```
INDEX COMMAND: *** PAGE 1 READY ***
PAGE 1... INDEX
PAGE 2... DISK CONTROL
PAGE 3... KEYBOARD CONTROL
PAGE 4... HARMONIC ENVELOPES
PAGE 5... WAVEFORM GENERATION
PAGE 6... WAVEFORM DRAWING
PAGE 7... CONTROL PARAMETERS
PAGE 8... SOUND SAMPLING
PAGE 9... SEQUENCER
PAGE D... WAVEFORM DISPLAY
PAGE L... DISK LIBRARY
PAGE C... COMPOSER
PAGE A... ANALOG INTERFACE
USER NAME : FAIRLIGHT AUSTRALIA
```



V3.C5.09

1. HELP PAGE instructions
2. COMMAND descriptions
3. ASSIGNMENT descriptions
4. DISPLAY PAGE selection
5. USER NAME assignment
6. SYSTEM FUNCTION index
7. LOAD/SAVE voice or instrument files



P A G E 1 P a g e I n d e x

This page is an index, or menu, which shows you all the available pages and their functions. It is the first picture that appears after the system disk is loaded in the left hand disk drive. It is not used to change sound parameters, but rather as a starting point from which to procede.

Hold the lightpen as you would hold a pen, taking care not to touch the end beyond the black plastic ring. Put the tip of the lightpen on the screen and point to "PAGE 2 DISK CONTROL". Now, touch the front of the lightpen with your index finger as shown.

Alternatively, type "P2" and then press the "RETURN" key. You will hear the disk drive load Page 2, and a new picture will appear on the screen. To get back to PAGE 1 touch the lightpen to the box at the top left hand corner of the screen marked "INDEX". Alternatively, type P1<return>.

```
*****
**
** 1.  HELP PAGE instructions  **
**
*****
```

A HELP PAGE accompanies each standard DISPLAY PAGE, with full guidance for the use of the various features provided. A "screen-full" of help is called a SHEET - each help page consists of several of these sheets.

A HELP INDEX is provided on the FIRST sheet of every help page to allow quick access to HELP for major features in two ways:

1. BY TYPING the sheet number and pressing <set> key.
2. BY TOUCHING an illuminated INDEX BOX with the LIGHTPEN ("Touch" means: point pen at item without touching tip with finger then "trigger" by a quick touch on tip.)

These INDEX BOXES are also provided throughout the HELP page. Any word inside an illuminated box may be touched with the lightpen for help on that topic. See PREVIOUS SHEET BOX.

TO CHANGE HELP SHEETS

<u>PRESS:</u> <add> key	<u>TO:</u> go forward to next sheet
<sub>	go backward to preceding sheet
<set>	go to 1st sheet (HELP INDEX)
(sheet no.)<set>	go to any sheet; e.g. 3<set>
<clear> or <return>	return to DISPLAY PAGE

TO CHANGE HELP SHEETS with LIGHTPEN five "touchable" boxes are provided at the top of each sheet as well as the INDEX BOXES placed around key words.

<u>TOUCH:</u> <FWD> box	<u>TO:</u> go forward to next sheet
<BWD>	go backward to preceding sheet
<TOP>	go to 1st sheet - HELP INDEX
<PRE>	go to <u>previous sheet</u>
<PAGE x>	return to DISPLAY PAGE
<INDEX BOX>	select sheet for illuminated word

THE PREVIOUS SHEET BOX: <PRE> is related to the illuminated INDEX boxes found around key words. When an INDEX box is touched with the lightpen, the sheet for that topic will be selected.

Touching <PRE> will then take you back to the original (previous) sheet. In fact you can backtrack through consecutive INDEX box touches in this way; each touch of <PRE> will take you back one further previous sheet. Thus the HELP sheets can be easily browsed with the LIGHTPEN without losing your place.

ALL COMMANDS provided by the DISPLAY PAGE shown at upper-left may be typed WHILE the HELP page is selected. Simply type the command as described by the HELP sheet. You will exit back to the display page automatically.

```
*****
**
** 2. COMMAND descriptions
**
*****
```

CONCISE DESCRIPTIONS of what you are to TYPE or touch with the LIGHTPEN to use the DISPLAY PAGES are presented with the aid of a few symbolic conventions.

Special Keys are indicated with lower-case letters within "<>" brackets: <return>, <set>, <add>, <sub>, <clear>, etc.

Lightpen Items are indicated with upper-case letters within "<>" brackets: <FWD>, <BWD>, <TOP>, etc.

Items which are defined when typed are indicated with lower-case letters (see "n" & "s" in the following example).

COMMANDS tell the CMI to "do something". The <return> key is always the last key typed. Commands are described like this....

TO SELECT a HELP PAGE

type:

```
select HELP for current DISPLAY page - H<return>
select HELP for DISPLAY page (n) - Hn<return>
select HELP for page (n), SHEET (s) - Hn,s<return>
  where: n = name (number or letter) of page: 1-9,D,L
         s = sheet number
```

EXAMPLES: H2<return> Select PAGE 2 HELP (sheet 1)  
 HD,2<return> Select PAGE D HELP, sheet 2

This command may be given from either a DISPLAY or HELP page.

```
*****
**
** 3. ASSIGNMENT descriptors
**
*****
```

ASSIGNMENTS change the values, or "settings" of variable parameters. The <set> key is usually the last key typed. Assignments are described like this example from PAGE 3....

To SET MASTER PITCH use <arrow> keys or LIGHTPEN to TAB to PITCH  
 TYPE: n<set>

where: n = desired tuning, 0 - 255

Because the value is a number we call this a NUMERIC assignment (as opposed to ALPHABETIC where the value is a word or name).

When making ANY NUMERIC ASSIGNMENT the <add> or <sub> keys can be used instead of <set> to ADD or SUBTRACT the typed number from the current value. The use of these keys is up to you; thus they are not often mentioned but are always available.

TABBING to an ITEM means to SELECT it for an assignment. This can be done with either the 4 <arrow> keys or LIGHTPEN.

ARROW KEYS: Press necessary keys to move the CURSOR (illuminated box) to the desired item.

LIGHTPEN: Touch displayed value of item.

THE COMMAND LINE is NOT CLEARED after a COMMAND ERROR or any ASSIGNMENT. The NEXT key typed will automatically clear the command line UNLESS it is one of the following keys:

<rubout> <arrow> <home> <add> <sub> <set>

```
*****
**
** 4. DISPLAY PAGE selection
**
*****
```

TO SELECT A DISPLAY PAGE

TYPE: Pn<return>

where: n = fill in the number or letter of desired page.

<return> = the RETURN key

EXAMPLE: P2<return> (select DISPLAY PAGE 2)

On PAGE 1 the LIGHTPEN may be used to select any other page by touching the page name or title. On other pages, touching the word INDEX (at upper left) will re-select PAGE 1.

```
*****
**
** 5. USER NAME assignment
**
*****
```

TO SET USER NAME ON SYSTEM DISK

First, use <down-arrow> key to TAB (move illuminated cursor) to USER NAME.

TYPE: up to 20 characters<set>

where: <set> = the SET key.

SYSTEM FUNCTION INDEX

The next sheet is a index of SYSTEM FUNCTIONS and the DISPLAY PAGES on which they are provided. Wherever a function is found on more than one page, parentheses indicate the HELP page with the most comprehensive description.

```
*****
**
** 6. SYSTEM FUNCTION index
**
*****
```

KEYBOARD / REGISTER CONTROL

DISPLAY (help) PAGES:

Keyboard Number selection	1 2(3)4 5 6 7 8 9 D L C
Nphony control / Register creation	. . 3 . . . . .
Register-to-Keyboard mapping	. . 3 . . . . .
Tuning	. . 3 . . . . .

<u>VOICE CONTROL</u>	<u>DISPLAY (help) PAGES:</u>
Harmonic Waveform Synthesis	. . . (4)5 . . . . .
Video-graphic Waveform Drawing	. . . . . 6 . . . . .
External Audio Waveform Sampling	. . . . . 8 . . . . .
Display Voice waveform	. . . . . 5 6 . . . D . . .
Mode	. . . 3 . . . (7) . . . . .
Loop	. . . (4) . . . 7 . . . . .
Amplitude	. . . 4 . 6(7) . . . . .
Vibrato / Glide / Key velocity	. . . . . 7 . . . . .
Keyboard Controls & Switches	. . . . . 7 . . . . .

<u>SEQUENCER CONTROL</u>	
Record / Replay Keyboard Sequences	. . . . . 9 . . . . .
Create / Edit / Replay M.C.L files	. . . . . C . . . . .

<u>DISK CONTROL</u>	
Display / Change Filenames	. 2 . . . . .
Load / Save Voice or Instrument file	1 2(3)4 5 6 . 8 . D L .
Load / Save Control file	. . . . . 7 . . . . .
Load Keyboard Sequence files	1 2 3 4 5 6 . 8(9)D L .
Load files by Keypad on master kbd	1(2)3 4 5 6 7 8 9 D L C
Free Space remaining on disk	. (2) . . . . . 9 . . . . .
Delete / Transfer files	. 2 . . . . .
Disk Library	. . . . . L .

```
*****
**
** 7. LOAD/SAVE instrument or voice files **
**
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS type:

To LOAD a VOICE - L,r,filename<return>  
 To SAVE a VOICE - S,filename<return>  
 To CREATE a VOICE - C,r,filename<return>  
 To LOAD an INSTRUMENT - L,filename.IN<return>  
 To SAVE an INSTRUMENT - S,filename.IN<return>

where: r = register A - H  
 filename = 1-8 character filename

**EXAMPLES:**

L,LUCK.IN<return> Load instrument file LUCK  
 L,A,FUZZ<return> Load voice file FUZZ into register A  
 C,A,NEWV<return> Create voice NEWV in register A

These commands may be given from ALL standard DISPLAY PAGES except PAGES 7 & 9. See PAGE 3 HELP for more about VOICES, INSTRUMENTS, and LOADING/SAVING files. See PAGE 2 HELP to LOAD files with LIGHTPEN.

INDEX *** PAGE 2 - READY ***																	
COMMAND: █																	
DISK CONTROL																	
DISK: VOGEL					FREE SPACE: 24												
USER: FAIRLIGHT					LIBRARY NO: 0												
1	ASIA	.IN	16	GUITAR2	.VC	31	ORGAN6	.CO	46	BOOM1	.PT						
2	FILM	.IN	17	LA	.VC	32	TYMP	.CO	47	CBELL1	.PT						
3	INVENT	.IN	18	ORGAN6	.VC	33	VOICE3	.CO	48	DRONE1	.PT						
4	PRELUDE	.IN	19	TYMP	.VC	34	ASIA	.SQ	49	FILM1	.PT						
5	VIVALDI	.IN	20	VOICE3	.VC	35	FILM	.SQ	50	FILM2	.PT						
6	AH3	.VC	21	AH3	.CO	36	INVENT	.SQ	51	FILM3	.PT						
7	ARR	.VC	22	ARR	.CO	37	PRELUDE	.SQ	52	FILM4	.PT						
8	ARR1	.VC	23	ARR1	.CO	38	VIVALDI1	.SQ	53	FILM5	.PT						
9	BASSDR	.VC	24	BASSDR	.CO	39	ASIA	.PC	54	FILM6	.PT						
10	CBELL	.VC	25	CBELL	.CO	40	FILM	.PC	55	FILM7	.PT						
11	CHENG	.VC	26	CHENG	.CO	41	INVENT	.PC	56	FILM8	.PT						
12	DO	.VC	27	DOBUCCHI	.CO	42	PRELUDE	.PC	57	FLUTE1	.PT						
13	ELORG	.VC	28	ELORG	.CO	43	VIVALDI	.PC	58	INVENT1	.PT						
14	FLUTE	.VC	29	FLUTE	.CO	44	ALTO	.PT	59	INVENT2	.PT						
15	GUITAR1	.VC	30	GUITAR	.CO	45	BASSO	.PT	60	SOP	.PT						
REGISTER: <b>A B C D E F G H</b>					LOAD					MULTI CANCEL							
TRANSFER			DELETE			QUERY			CMI <b>ALL</b> MCL								
<b>ASIA</b>										<b>IN</b>		<b>FILETYPE=INSTRUMENT</b>		<b>VERSION=1</b>		<b>SIZE=24</b>	
VOICES=CHENG				FLUTE				BASSDR				CBELL					
												TYMP					

1. FILENAMES and types
2. FREE SPACE on disk
3. LIBRARY number
4. SELECTING files (MULTI & CANCEL)
5. CHANGING disk, user or file names
6. QUERY command
7. SAVING instrument or voice files
8. LOADING instrument files
9. LOADING voice files
10. LOADING sequence files
11. DELETE command
12. TRANSFER command
13. DELETE/OVERWRITE protection
14. KEYPAD on master keyboard
15. COMMAND shortcuts





```

*****
**
** 4. SELECTING files (MULTI & CANCEL) **
**
*****

```

#### SELECTING FILES for LIGHTPEN COMMANDS

The PAGE 2 lightpen commands all operate on files and require that filename(s) be selected before using a command.

To select a single file, use <arrow> keys or lightpen to TAB to the filename (illuminating it).

To select multiple files (shown by boxes around file numbers),

TYPE:	LIGHTPEN:
(Choose file with <arrow> keys or lightpen.)	Touch <MULTI>.
Press <add> key to select file.	Touch desired files.
Press <sub> key to unselect file.	Touch <CANCEL> to unselect.

Descriptions below indicate these procedures with the terms:  
<select file> and <select files>.

To RESET (cancel all multiple file selections) TYPE: <clear>

```

*****
**
** 5. CHANGING disk, user or file names **
**
*****

```

#### TO CHANGE DISK NAME, USER NAME or FILENAME

First, select item with <arrow> keys or LIGHTPEN.

TYPE:

<1-20 characters><set>	:USER NAME
filename<set>	:FILENAME or DISK NAME
where: filename = 1-8 letters or numbers;	
1st must be a letter.	

When a filename is changed it will automatically be positioned alphabetically within the list of filenames.

```

*****
**
** 6. QUERY command **
**
*****

```

<u>TO QUERY A FILE</u>	TYPE:	LIGHTPEN:
	Q,file<return>	<select file>
		<QUERY>

where: file = FILENAME.SF :filename with suffix  
or  
file = ## :file number

EXAMPLES: Q,ZOOM.VC<return>  
Q,14<return>

Version number, size and type will be displayed for selected file.  
VOICE names within INSTRUMENT files and CONTROL file names within  
VOICE files will also be displayed.

```
*****
**                                     **
**      7. SAVING instrument or voice files      **
**                                     **
*****
```

TO SAVE INSTRUMENT or VOICE FILE TYPE:

```
INSTRUMENT: S,filename.IN<return>
              or
              S,IN,filename<return>
VOICE:       S,filename<return>
```

```
EXAMPLE: S,ORCHY.IN<return>   (save instrument:ORCHY)
          S,FLUTE<return>     (save voice:FLUTE)
```

See PAGE 3 for more about SAVE command.

```
*****
**                                     **
**      8. LOADING instrument or voice files      **
**                                     **
*****
```

TO LOAD INSTRUMENT FILE (.IN suffix)

```
TYPE:          LIGHTPEN:
L,filename.IN<return>   <select file>
              or       <LOAD>
L,IN,filename<return>
```

```
EXAMPLE: L,NICEINST.IN<return>
          L,IN,NICEINST<return>
```

An INSTRUMENT file will not load if any of the required VOICE files  
are not found (see PAGE 3). Use QUERY command to see voice names  
within an instrument file.

```
*****
**                                     **
**      9. LOADING voice files      **
**                                     **
*****
```

TO LOAD VOICE FILE (.VC suffix)

```
TYPE:          LIGHTPEN:
L,r,filename<return>   <select files>
  where: r = register: "A-H"  <select REGISTER>
                              <LOAD>
```

```
EXAMPLE: L,B,TRUMPS<return>
```

When using the lightpen, <select REGISTER> means touch the desired register in the REGISTER SELECTOR (inside LOAD box). This determines into which register the voice will be loaded. There are eight possible registers A-H depending on the setting of NPHONY on PAGE 3. Empty selection boxes indicate further possible registers. If the desired register is already selected (illuminated) then this step may be omitted. Loading INSTRUMENT files may change the number of available registers. Note that multiple VOICE files may be loaded into a single register if NPHONY has been set accordingly. See PAGE 3.

```
*****
**                               **
**      10. LOADING sequence files      **
**                               **
*****
```

TO LOAD KEYBOARD SEQUENCE FILE (.SQ suffix)

TYPE:	LIGHTPEN:
L,filename.SQ<return>	<select file>
	<LOAD>

Loads PAGE 9 KEYBOARD SEQUENCER REPLAY FILE (see PAGE 9).

```
*****
**                               **
**      11. DELETE command              **
**                               **
*****
```

TO DELETE FILE(S) FROM DISK

TYPE:	LIGHTPEN:
D,file<return>	<select files>
or	<DELETE>
D,file,file,file(...etc)<return>	

where: file = FILENAME.SF :filename including SUFFIX  
or  
file = ## :displayed number of file (eg,"17")  
or  
file = ##-## :range of file numbers (eg,"4-27")  
or  
file = \* (asterisk) :ALL FILES ON DISK

EXAMPLES: D,THING.VC<return>  
D,2,5-9,REGS2.IN,THING.CO,27<return>  
D,\*<return>

When a file is DELETED it is permanently removed from the disk, freeing the space it occupied. See DELETE/OVERWRITE PROTECTION.

TO CREATE a BLANK DISK TYPE: D,\*;Y<return>

Due to the scope of this operation, two confirmation messages will appear; reply to both by typing: Y<return>.

ALL files on the disk will be DELETED.

```
*****
**                               **
**    12. TRANSFER command      **
**                               **
*****
```

TO TRANSFER FILES TO ANOTHER DISK

```
TYPE:                                LIGHTPEN:
  T,file<return>                       <select files>
    or                                  <TRANSFER>
  T,file,file,file(...etc)<return>
where: file = FILENAME.SF or ## or ##-## or *
          (same as DELETE; see above)
```

```
EXAMPLES: T,CHORUS.IN<return>
          T,4-18,ABLE.VC,25<return>
```

Files will be copied FROM disk in RH drive (DISK A) TO another disk in LH drive (DISK B). Give TRANSFER command with system disk in LH drive and DISK A in RH drive. When the message:

PLACE FILE DISK IN LH DRIVE

appears, place DISK B in LH drive. When the transfer is completed a final message will request the replacement of the system disk. If a file already exists on DISK B (has same name and suffix as file on DISK A), it will NOT be overwritten without your consent. See also DELETE/OVERWRITE PROTECTION.

TO COPY an ENTIRE DISK TYPE: T,\*<return>

When the message appears place a BLANK file disk in LH drive.

Replace system disk when completed. New disk will usually show an increase in FREE SPACE available.

```
*****
**                               **
**    13. DELETE/OVERWRITE protection  **
**                               **
*****
```

DELETE/OVERWRITE PROTECTION

As a safeguard, the TRANSFER and DELETE commands will not overwrite (write to an existing file) or delete a file without first requesting your confirmation. The message:

DELETE/OVERWRITE <filename> (Y)??

will appear and the system waits for your reply.

```
TO REPLY:                                TYPE:
  YES, go ahead.                          Y<return>
  NO, skip to next
  specified file (if any). N<return> (or just <return>)
  NO, stop the command.                   press & hold <ctrl>, press <esc>
```

This will occur for EACH file to be deleted or overwritten if more than one file is specified in the command. To restrict this protection to a single confirmation for all selected files, type "<semicolon>Y" before pressing <return> for the command. Then reply as above to the message which appears.

```
EXAMPLES: D,10-19;Y<return>
          T,ANICE.VC,ANICE.CO;Y<return>
```

```
*****
**
**      14. KEYPAD on master keyboard
**
*****
```

MUSIC KEYBOARD KEYPAD & LED DISPLAY

	TYPE (on keypad):
To DISPLAY last ERROR MESSAGE:	<*>
To DISPLAY a FILENAME:	D##<*>
To LOAD .IN or .SQ FILE:	##<*>
.VC FILE:	##<*> or #r<*>

where: <\*> = "\*" on keypad - equivalent to <return>.  
 ## = FILE NUMBER on PAGE 2 (not <#> key; see below)  
 r = REGISTER: "A-D". If register is not specified when loading a voice, the REGISTER SELECTOR on PAGE 2 will determine the register loaded.

note: <#> key on keypad functions like <rubout> key to delete last key typed.

EXAMPLES: D13<\*>       :DISPLAY name of file 13.  
           32B<\*>       :Load (voice) file 32 into register B.

Keypad commands may be given from ALL standard display pages, and cause PAGE 2 to be automatically selected. See also COMMAND SHORTCUTS.

```
*****
**
**      15. COMMAND SHORTCUTS
**
*****
```

COMMAND SHORTCUTS

Loading files: All KEYPAD commands may also be typed on your ALPHANUMERIC keyboard by using <ctrl-E> (press & hold <ctrl>, press <E>) instead of the keypad <\*> key. This allows files to be loaded by typing only the file NUMBER and <ctrl-E>. Registers A-H may also be specified when loading voice files. This may be done from ANY standard display page.

EXAMPLES:  
           12<ctrl-E>   :LOAD file 12.  
           7C<ctrl-E>   :LOAD (voice) file 7 into register C.

All PAGE 2 TYPED Commands: If only the 1st letter of a command is typed followed by <return> then filenames may be chosen as for a lightpen command ( see SELECTING FILES).

EXAMPLES:  
 To DELETE files    - <select files> then type: D<return>  
 To QUERY any file - <select file> then type: Q<return>  
 To LOAD any file  - <select file> then type: L<return>  
 To LOAD MULTIPLE VOICES - <select files> type: L<return>

INDEX		*** PAGE 3 - READY ***					
COMMAND:							
REGISTER CONTROL							
REGISTER	NPHONY	VOICE	MODE	OCT	SEMI	FINE	CHANNELS
A	2	1) CHENG	4	0	0	-99	12.....
B	1	2) FLUTE	1	-2	0	0	..3.....
C	1	3) BASSDR	1	0	0	12	...4....
D	1	4) CBELL	1	0	11	0	....5...
E	1	5) TYMP	4	0	1	0	.....6..
F	1	6) VOICE3	4	6	0	0	.....7.
G	1	7) GUITAR2	4	0	0	0	.....8

KEYBOARD CONTROL								
KBD	SELECTION						MASTER TUNING	
1	A	A	F	F	F	F	3 : MASTER 6 : SLAVE	PITCH: 128
2	A	A	A	G	A	A		SCALE: 137 $\sqrt{6.85}$
3	A	A	A	A	G	A		
4	A	A	G	G	E	E		
5	B	B	B	B	B	B		
6	C	C	C	C	C	C		
7	D	G	D	D	D	D		
8	E	E	E	E	E	E		

1. REGISTER control
2. NPHONY of a register
3. TUNING of a register
4. NAME/MODE of a voice
5. KEYBOARD control
6. SELECTION of a keyboard number
7. MAPPING of registers to the keyboards
8. PITCH/SCALE tuning controls
9. VOICE files
10. LOAD voice command
11. SAVE voice command
12. MULTI-VOICE load command
13. CREATE voice command
14. INSTRUMENT files
15. LOAD instrument command
16. SAVE instrument command
17. PROTECTION against overwriting your files
18. OPTIONS to use with the SAVE commands



P A G E 3    K e y b o a r d   C o n t r o l

Page 3 shows you voice tunings and allocation. On this page you can see which voices are coming out of the eight audio channels at the back of the C.M.I.. Any voice can be tuned in increments of +/- 1/100 of a semitone to +/- 6 octaves with quartz-crystal accuracy. Furthermore, the Western tempered tuning of 12 root 2.00 (doubling of pitch every 12 semitones) can be changed to any other macro/micro-tuning. For example, to get 1/4 tones change the tuning to 24 root 2.00.

A master tuning control can vary the pitch of all loaded voices by +/- 1/4 tone in 256 discreet steps to tune in with other musical instruments if necessary. All such tunings can be "saved" for later recall.

A voice can be allocated to any of the 6 octaves in any of the 8 keyboards in the C.M.I.'s memory. As well, up to eight different voices can be loaded onto a single keyboard note.

```
*****
**                               **
**   1. REGISTER control         **
**                               **
*****
REGISTER CONTROL
```

REGISTERS are groups of 1 or more of the eight OUTPUT CHANNELS. You may have from 1 to 8 registers (identified by the letters: A-H) provided the TOTAL of their channels is not more than 8.

Each register may be:    LOADED with one or more voice files.  
                           MAPPED to any octaves of the keyboard  
                                           so the voice(s) may be played.  
                           TUNED in three ranges.

```
*****
**                               **
**   2. NPHONY of a register     **
**                               **
*****
```

TO SET NPHONY of a REGISTER

Use <arrow> keys to TAB to NPHONY for desired register.

TYPE:    n<set>

where: n = desired polyphony: 0 - 8

Channels are allocated to each register BY THE SYSTEM according to the polyphonic capability desired (number of notes that can be played at once). This is the NPHONY for the register. The default condition provides one register (A) with NPHONY=8; consuming channels T1-8 and precluding any more registers.

To CREATE a NEW REGISTER reduce the NPHONY of the last register (bottom of NPHONY column). When the channel total is LESS than eight, a new register will be available with an NPHONY of zero. TAB down and set the desired nphony.

To DISPOSE of REGISTERS set NPHONY to zero. This will dispose the register AND ALL REGISTERS BEYOND (higher letters).

WARNING: any voices IN the disposed register(s) will be LOST.

```
*****  
**  
** 3. TUNING of a register **  
**  
*****
```

TO ADJUST TUNING of a REGISTER

Use <arrow> keys to TAB to OCT SEMI or FINE for the register.

TYPE: nn<set>

where: nn = OCT : -6 - +6 (octaves)

SEMI: -11 - +11 (semitones)

FINE: -99 - +99 (1/100 semitones)

You may type <minus>nn to <set>,<add>,<sub> a negative value. This alters the tuning offset for the selected register. Any change will require a moment to take effect. You may make alterations as rapidly as you desire as long as you realize the CMI is "catching up" behind you. A short delay may occur when selecting some display pages just after tuning a register. The TUNING of REGISTERS is SAVED & LOADED with INSTRUMENT FILES.

TO RESET PAGE 3 TYPE: R<return>

This resets PAGE 3 (the INSTRUMENT) to the start-up (default) condition: 1 register (A) with NPHONY=8, no voices loaded.

The following message will appear before proceeding:

RESET INSTRUMENT - UNLOAD ALL VOICES (Y)?

To reply Yes, type: Y<return>

To reply NO, type: N<return> or <return> or <ctrl-esc>.

WARNING: All voices will be "unloaded" and thus LOST if not previously SAVED.

```
*****  
**  
** 4. NAME/MODE of a voice **  
**  
*****
```

TO ASSIGN A VOICE NAME

Use <arrow> keys to TAB to name in the "VOICE" column.

TYPE: filename<set>

where: filename = 1-8 character filename without suffix  
(See PAGE 2 HELP)

This simply changes the name of the voice AS LOADED - and has nothing to do with the VOICE FILENAME on disk (which may be changed on PAGE 2). You may assign to a BLANK voice name (in an un-loaded register) in which case the result is the same as CREATING a VOICE (see below) except the WAVEFORM is NOT zeroed and the voice will not be automatically saved.

TO SET MODE of a VOICE

Use <arrow> keys to TAB to MODE for desired voice.

TYPE: n<set>

where: n = desired MODE: 1 or 4

This changes the operating MODE of the channels assigned to the voice. See PAGE 4 & 7 HELP for more about MODE. The MODE setting is LOADED & SAVED as part of a VOICE FILE.

CHANNEL DISPLAY shows which AUDIO OUTPUT CHANNELS are allocated to each voice. These numbers correspond to the audio output sockets on the back panel.

```
*****  
**  
** 5. KEYBOARD control **  
**  
*****
```

KEYBOARD CONTROL

THE KEYBOARD MAPS each consist of a KEYBOARD NUMBER followed by six letters indicating the REGISTER assigned to each octave. The SELECTION table allows you to assign any of the eight keyboard numbers to the MASTER or SLAVE music keyboard, thus "linking" it to the corresponding map. Keys in any octave will then activate the register chosen for that octave. Sequences made with the KEYBOARD SEQUENCER or M.C.L. also have keyboard numbers determining the map to which they link when replayed.

The KEYBOARD MAPS are LOADED & SAVED as part of an INSTRUMENT FILE.

```
*****  
**  
** 6. SELECTION of a keyboard number **  
**  
*****
```

TO SET KEYBOARD SELECTION NUMBER

Use <arrow> keys to TAB to MASTER or SLAVE, TYPE: n<set>

where: n = keyboard map no. 1 - 8

This links the selected MUSIC keyboard to the desired KEYBOARD MAP. The selection is NOT confined to PAGE 3 - the keyboard will now remain linked to the map on any page.

TO SET KEYBOARD SELECTION NUMBER from ANY DISPLAY PAGE

TYPE: Kn<return> - to set master kbd  
KS n<return> - to set slave kbd

```
*****  
**  
** 7. MAPPING of registers to the keyboards **  
**  
*****
```

TO ASSIGN REGISTERS to KEYBOARD MAPS

To assign to ALL SIX octaves of a keyboard...

TYPE: LIGHTPEN:  
Use <arrow> keys to TAB to keyboard <select REG>  
number in "KBD" column. <select KBD>  
r<set>

To assign to ONE octave of a keyboard...

TYPE:	LIGHTPEN:
Use <arrow> keys to TAB to octave within keyboard map.	<select REG> <select octave>
r<set>	

where: r = desired register A - H

When using the lightpen <select REG> means touch the desired register in the "REG" column. If the register is ALREADY selected (illuminated), this step is unnecessary. Once a register is selected, just touch the keyboard number or octave to <select KBD> or <select octave>.

```
*****
**      8. PITCH/SCALE tuning controls    **
**                                         **
*****
```

TO ADJUST SYSTEM MASTER PITCH

Use <arrow> keys to TAB to PITCH, TYPE: n<set>  
where: n = 0 - 255

This provides a tuning adjustment for the entire system of about +/- 1/2 semitone. The normal (default) setting is 128 and will produce A = 440 Hz. The master pitch will be SAVED and LOADED as part of an INSTRUMENT FILE.

TO DEFINE KEYBOARD SCALE FUNCTION

Use <arrow> keys to TAB to desired item, TYPE: n<set>  
where: n = desired value

The SCALE function sets the PITCH INCREMENT (change in pitch between keys) for the system. The normal (default) setting is:

$$12 \sqrt[12]{2.00} \text{ (pronounced: twelfth root of two)}$$

The 12 is the ROOT, 2 is the BASE(integer) and 00 is the BASE(fraction). This setting defines the standard tempered scale by specifying that 12 keys change the pitch by a factor of 2 (1 octave). For example to specify a 1/4-tone scale, set ROOT to 24 and BASE to 2; i.e, 24 keys = 1 octave. The SCALE setting will be SAVED & LOADED as part of an INSTRUMENT FILE.

RANGES: ROOT=1-255 BASE(integer)=1-7 BASE(fraction)=0-99

```
*****
**      9. VOICE files                    **
**                                         **
*****
```

LOADING and SAVING VOICES

A VOICE is a CMI "sound" consisting of:

WAVEFORM

Digital waveform for the voice; synthesized on PAGES 4-6  
or sampled from external source on PAGE 8.

HARMONIC AMPLITUDE PROFILES

Dynamic amplitude profiles for 32 harmonics; used on  
PAGES 4 and 5 for timbre and amplitude modification.

MODE & LOOP

Operating mode for output channels and waveform loop position (see PAGE 7 & 4 HELP).

CONTROL FILE NAME

The name (if any) assigned to CONTROL FILENAME on PAGE 7. This may all be SAVED on RH disk as a VOICE FILE (.VC suffix). By LOADING the file all characteristics of the voice will be restored. If there is a CONTROL FILE NAME on PAGE 7 when the voice is SAVED then that CONTROL FILE will be automatically loaded with the VOICE FILE (see PAGE 7 HELP for more about control files). The SAVE/LOAD/CREATE voice commands described below may be used from ALL standard display pages EXCEPT 7 & 9.

NOTE: As in most CMI commands, wherever commas are indicated spaces may be used instead.

```
*****
**
** 10. LOAD voice command  **
**
*****
```

TO LOAD A VOICE TYPE: L,r,filename<return>

where: r = register A - H  
filename = 1-8 character voice filename with or without the .VC suffix (see PAGE 2 HELP)

EXAMPLE: L,H,CYMB3<return> - Load CYMB3.VC into register H

The register must exist, i.e.: NPHONY not zero. If the file is found on RH disk it will be loaded. If a CONTROL FILE NAME was linked to the voice with the SAVE or PAGE 7 "LNK" commands it will be loaded after the voice; otherwise the PAGE 7 CONTROL PARAMETERS will be reset to their defaults (see PAGE 7 HELP).

```
*****
**
** 11. SAVE voice command  **
**
*****
```

TO SAVE A VOICE TYPE: S,filename<return>  
or: S,filename,newname<return>

where: filename = name of a loaded voice (shown on PAGE 3)  
with or without .VC suffix  
newname = new filename; to SAVE with a different name

EXAMPLE: S,FLUID<return> - Save voice FLUID.VC  
S,FLUID,FLUID2<return> - Save voice FLUID.VC in file FLUID2.VC

The selected VOICE will be SAVED, with a new name if desired. See also OVERWRITE PROTECTION and SAVE COMMAND OPTIONS below.

```
*****  
** 12. MULTI-VOICE load command **  
*****
```

TO LOAD MULTIPLE-VOICES TYPE: L,r,filename,filename,...<return>

where: r = register A - H  
filename = 1-8 character voice filename with or without  
.VC suffix (see PAGE 2 HELP)  
,... = continue up to eight filenames

EXAMPLE:

L,B,DRUM,BRICK,DOG<return> - Load voice files: DRUM.VC,  
BRICK.VC and DOG.VC into  
register B

If more than one VOICE is loaded into a register the number of channels required by the register will be NPHONY multiplied by the NUMBER of VOICES. Thus the NPHONY must be set such that the channel TOTAL does not exceed 8 BEFORE loading multiple voices. The register becomes a MULTI-VOICE REGISTER: one key will play all its voices. For example, if NPHONY of register A is set to 1 and B to 0, register A may be loaded with EIGHT voices - all of which will play when the register is activated.

type: L,A,V1,V2,V3,V4,V5,V6,V7,V8<return>  
where: V1,V2,etc = eight voice filenames

See PAGE 2 to LOAD multiple voices by LIGHTPEN.

```
*****  
** 13. CREATE voice command **  
*****
```

TO CREATE A NEW (BLANK) VOICE TYPE: C,r,filename<return>

where: r = register A - H  
filename = 1-8 character voice filename with or without  
the .VC suffix (see PAGE 2 HELP)

EXAMPLE: C,A,BOOM<return> - Create new voice BOOM.VC  
in register A

The register must exist, i.e: NPHONY not zero. A new VOICE will be created in the register with a null WAVEFORM and HARMONIC PROFILES (PAGE 4). CONTROL PARAMETERS (PAGE 7) will all be reset to default values. The VOICE MODE may be set before the CREATE command is given. Once created, the new voice is automatically SAVED. However, if the CREATE command is given with a full disk, or NO disk in the RH drive, the voice will still have been successfully created in the register. See also OVERWRITE PROTECTION , SAVE COMMAND OPTIONS and TO ASSIGN A VOICE NAME.

```
*****  
**  
** 14. INSTRUMENT files **  
**  
*****
```

LOADING and SAVING INSTRUMENTS

The INSTRUMENT consists of:

REGISTER CONTROL SETTINGS

Including the NPHONY and TUNING for all registers.

VOICE NAMES

The names of all loaded VOICES.

KEYBOARD CONTROL SETTINGS

The KEYBOARD MAPS and MASTER TUNING controls.

Thus DISPLAY PAGE 3 is the INSTRUMENT and may be SAVED as an INSTRUMENT FILE (.IN suffix). By LOADING the file, the entire previous state of the CMI can be restored - all VOICE FILES will be automatically LOADED again PROVIDED they are all found on the RH disk. The LOAD/SAVE instrument commands described below may be used from ALL standard display pages EXCEPT 7 & 9.

```
*****  
**  
** 15. LOAD instrument command **  
**  
*****
```

TO LOAD AN INSTRUMENT TYPE: L,filename.IN<return>  
or: L,IN,filename<return> (old format)  
where: filename = 1-8 character filename (see PAGE 2 HELP)  
EXAMPLE: L,BRASS.IN<return> - Load instrument file BRASS.IN

The REGISTER CONTROL and KEYBOARD CONTROL settings are LOADED and then all VOICE FILES are LOADED.

To HALT the loading for any reason, type: <ctrl-esc>  
( press & hold <ctrl> - press <esc> ).

```
*****  
**  
** 16. SAVE instrument command **  
**  
*****
```

TO SAVE AN INSTRUMENT TYPE: S,filename.IN<return>  
or: S,IN,filename<return> (old format)  
where: filename = 1-8 character filename (see PAGE 2 HELP)  
EXAMPLE: S,PERC.IN<return> - Save instrument file PERC.IN

The VOICE NAMES, REGISTER CONTROL and KEYBOARD CONTROL settings are SAVED. Note that an instrument file may be saved even when NO voices are loaded - thus favourite configurations may be saved as "setup templates" (these take only a moment to load).

To save VOICE FILES with instrument see SAVE COMMAND OPTIONS.



```

*****
** 17. PROTECTION against overwriting your files **
**
*****

```

#### OVERWRITE PROTECTION

When saving / creating voice or instrument files, if there is ALREADY a file on the disk with the same name & suffix this question will appear:

OVERWRITE filename.sf (Y)?

TO REPLY:

Yes, overwrite file - Y<return>

No, do not overwrite - N<return> or <return> or <ctrl-esc>  
( <ctrl-esc> = press & hold <ctrl> - press <esc> )

If desired, this protection may be turned-off by using the "yes" option  
- see SAVE COMMAND OPTIONS below.

```

*****
** 18. OPTIONS to use with the SAVE command **
**
*****

```

#### SAVE COMMAND OPTIONS

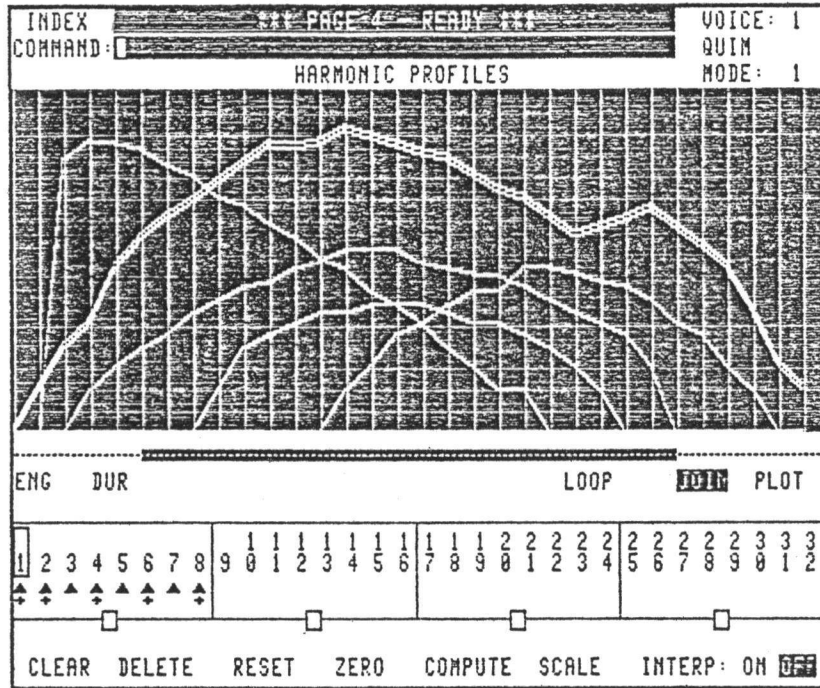
There are three options that may be used in conjunction with the commands to save voices and instruments. To use any or all of these,

TYPE: ;o before pressing <return> for the command.

where: o = option(s): V - "voice" option; save voice files with instrument file.  
C - "control" option; save control files with voices.  
Y - "yes" option; overwrite any existing files.

#### EXAMPLES:

S,FLUTES.IN;V<return> - Save instrument FLUTES and all loaded voices.  
S,FLUTE1;C<return> - Save voice FLUTE1 and its control file.  
S,BIGONE.IN;VC<return> - Save instrument BIGONE and all loaded voices AND control files.  
S,EASY;Y<return> - Save voice EASY, overwrite the file if it exists.  
S,BIGGEST.IN;YVC<return> - Save instrument BIGGEST including all voice and control files, overwrite any existing files.



1. PROFILE GRAPH
2. HARMONIC amplitude profiles
3. DURATION profile
4. ENERGY profile
5. DELETE/ZERO command
6. COMPUTE command
7. INTERP switch
8. SCALE command
9. JOIN/PLOT selector
10. LOOP control
11. CLEAR command
12. RESET command
13. VOICE selection
14. LOADING/SAVING files
15. WAVEFORM memory
16. MODE of a voice

P A G E 4      H a r m o n i c   P r o f i l e s

From here, up to 32 sinewave harmonic envelopes, a duration envelope and a master volume envelope can be drawn, displayed, modified and computed. A harmonic envelope is similar in concept to the simple ADSR (Attack-Decay-Sustain-Release) envelope on synthesizers, but with much greater flexibility.

Every harmonic overtone can have it's own amplitude (volume) profile. This a very quick and easy way to create electronically derived sounds. A looping feature means that any part of the overall waveform can be made to loop (sustain).

```
*****
**                               **
**   1.  PROFILE graph           **
**                               **
*****
```

THE PROFILE GRAPH allows changing parameters to be specified with the LIGHTPEN as PROFILES. The vertical scale represents AMPLITUDE (logarithmic); the horizontal represents TIME as WAVEFORM SEGMENTS. HARMONIC AMPLITUDE profiles provide control of the relative amplitudes of 32 harmonics. These are mathematically processed by the COMPUTE command to yield the implied waveform by the principle of ADDITIVE synthesis. Any loaded VOICE may be chosen for display or modification. The setup of the graph is preserved separately for each voice and is SAVED/LOADED as part of VOICE files. The MODE of the selected voice determines some important aspects of the profile graph and PAGE 4 in general.

When voice is in MODE 1 -

Each horizontal division represents 1 waveform segment.  
There are 32 waveform segments - 32 points per profile.  
The DURATION profile sets time-duration of each segment.  
The ENERGY profile controls voice amplitude envelope.  
The SCALE command is provided.

When voice is in MODE 4 -

Each horizontal division represents 4 waveform segments.  
There are 128 waveform segments - 128 points per profile.  
Duration of each segment is one cycle.  
The MODE 4 ATTACK parameter is provided on PAGE 7.  
(See PAGES 7 & 6 HELP for amplitude control in MODE 4.)

```
*****
**                               **
**   2.  HARMONIC amplitude profiles **
**                               **
*****
```

THE HARMONIC AMPLITUDE PROFILES are represented by the numbers 1-32 displayed across the screen. These numbers are lightpen switches to display each profile. If desired, all 32 profiles may be displayed on the graph simultaneously for viewing; however, more than about 10 at once usually looks confusing and can make the lightpen response sluggish. This means that it is possible for profiles to be un-displayed and yet still remain ACTIVE (contributing to the sound).

For this reason, two INDICATOR lights (blank if off) are located under each harmonic number to show the status of that profile.

(triangle) : display indicator - profile is now displayed.

(cross) : active indicator - profile has NON-ZERO value.

TO DISPLAY/OPEN a HARMONIC PROFILE touch the desired number with the LIGHTPEN. The profile will be DISPLAYED (if not already) and OPENED for modification with the LIGHTPEN. A BOX around the harmonic number and a DOUBLE LINE on the profile graph identify the open profile. The lightpen may now be used to modify the profile on the graph. See JOIN/PLOT. Only one profile can be open at a time. Opening a new profile leaves the previous one displayed. When harmonic profiles are altered no change will be heard in the voice until the COMPUTE command is given to translate the specified harmonic content into waveform. When OPEN the profile may be DELETED or ZEROED.

TO DISPLAY/SELECT a BLOCK of 8 HARMONIC profiles touch one of the BLOCK SELECTOR boxes centred under each group of 8 harmonic numbers. This will DISPLAY the 8 profiles on the graph. They are also now SELECTED for possible use of the DELETE or ZERO commands, which will act on ALL eight.

```
*****
**          3. DURATION profile          **
**          *****                      **
*****
```

The DURATION PROFILE sets the duration of each WAVEFORM SEGMENT in MODE 1. It can be OPENED and modified with the lightpen. The default value is approx 50 msec per segment (condition after the CREATE or RESET commands). When the voice is played each segment is repeated for a number of cycles determined by the combination of the duration profile and the pitch being produced. This maintains a fairly constant net event length for any pitch. If the duration profile is ZEROED a special case is created where each segment is only played once regardless of pitch; resembling MODE 4. This can be useful in converting externally sampled voices that are non-pitched to MODE 1, since these will not respond well to having each segment repeated.

```
*****
**          4. ENERGY profile          **
**          *****                      **
*****
```

THE ENERGY PROFILE defines the overall amplitude envelope of the voice when in MODE 1 - it does not exist in MODE 4. The energy profile is generated automatically by the COMPUTE command and it can be OPENED and modified with the lightpen. See also SCALE and LOOP.

TO DISPLAY/OPEN the ENERGY or DURATION PROFILE

Touch: <ENG> or <DUR> with the LIGHTPEN. The profile will be DISPLAYED (if not already) and OPENED for modification with the lightpen - see JOIN/PLOT. While open, the profile is displayed with a DOUBLE LINE on the graph and ENG or DUR is illuminated. The results of altering the energy or duration profile can be heard in the voice immediately (once you stop drawing). Display indicator lights (triangles) directly under ENG and DUR are lit whenever the profiles are displayed. When OPEN, either profile may be DELETED or ZEROED.

```
*****
**                                     **
**      5.  DELETE/ZERO  command      **
**                                     **
*****
```

<u>TO DELETE or ZERO PROFILE(S)</u>	TYPE:	or	LIGHTPEN:
delete profile from graph - D	<return>		<DELETE>
set profile to zero value - Z	<return>		<ZERO>

If a profile is OPEN for modification then it will be DELETED or ZEROED accordingly. If a HARMONIC BLOCK has been selected by touching one of the selection boxes under each group of 8 harmonics then those 8 harmonic profiles will be DELETED or ZEROED. Note that DELETE does not alter the value of a profile but only removes it from the graph - ZERO sets the value of the profile to zero for all segments.

```
*****
**                                     **
**      6.  COMPUTE  command          **
**                                     **
*****
```

<u>TO COMPUTE WAVEFORM from HARMONICS</u>	TYPE:	LIGHTPEN:
	C<return>	<COMPUTE>

The COMPUTE command processes the HARMONIC AMPLITUDE PROFILES to generate the implied waveform in each segment of WAVEFORM MEMORY for the voice. In MODE 4 this is done for 128 segments. In MODE 1, 32 segments are computed AND the ENERGY profile is calculated from the combined harmonic amplitudes. The waveform is always generated at optimum amplitude; i.e., if viewed on the PAGE 6 Waveform Graph, the amplitude will be a perfect "fit" within the 8-bit audio range of the CMI. In MODE 1 the amplitude changes are expressed in the ENERGY profile. Depending on the harmonic complexity, the COMPUTE will require -

- in MODE 1: max about 12 secs
- in MODE 4: max about 48 secs







```
*****
**                               **
**    13. VOICE selection       **
**                               **
*****
```

TO SELECT any loaded VOICE for display or modification,

TYPE: V,filename<return> or: V,n<return>

where: filename = the name of a loaded voice

n = the number 1-8 of a loaded voice

EXAMPLES: V,TUBA<return> - select voice TUBA

V,4<return> - select voice 4

The NAME, NUMBER & MODE of the current voice are shown in the upper-right corner of the page. The names and numbers of all loaded voices are shown on PAGE 3.

```
*****
**                               **
**    14. LOADING/SAVING files **
**                               **
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS TYPE:

To LOAD a VOICE - L,r,filename<return>

To SAVE a VOICE - S,filename<return>

To CREATE a VOICE - C,r,filename<return>

To LOAD an INSTRUMENT - L,filename.IN<return>

To SAVE an INSTRUMENT - S,filename.IN<return>

where: r = register A - H

filename = 1-8 character filename

See PAGE 3 HELP for more about loading/saving files. Note that the loading and saving of the setup of the PROFILE GRAPH as part of voice files is a new feature. When old voices are loaded they will initially have NO profiles displayed though non-zero profiles WILL be indicated. If you display any selection of profiles and then save the voice, that selection will be restored whenever the voice is loaded in the future.

```
*****
**                               **
**    15. WAVEFORM memory      **
**                               **
*****
```

WAVEFORM MEMORY contains the voice waveform in digital form, stored in the 16,384 bytes of memory provided in each channel. This memory is divided into 128 WAVEFORM SEGMENTS, each with 128 POINTS (bytes) of waveform. The basic principle of the CMI is to "replay" this memory at the rate required to produce the desired pitch. Each segment of memory contains exactly ONE CYCLE (period) of the waveform.

```

*****
**      16.  MODE of a voice      **
**      *****                    **

```

VOICE MODE controls the function of the waveform memory when a voice is played. There are 2 MODES: called MODE 1 and MODE 4. When developing a new voice, the mode should usually be chosen according to the method of waveform generation to be used:

Harmonic synthesis (PAGES 4,5) - MODE 1

Drawing/External sampling (PAGES 6,8) - MODE 4

However these are not RULES and the mode may be changed at any time. Each has quite different characteristics.

MODE 1: Segments 1-32 are used. Each segment in turn is sustained according to the DURATION profile position for the segment. During this time the amplitude is modulated according to the slope of the ENERGY profile. The net event duration remains virtually constant for any pitch.

MODE 4: Segments 1-128 are used. Each is played once before moving to the next segment (1 segment per cycle). The net event duration is (inversely) related to the pitch.

COMPUTE COMMAND - MODE 1:

```

harmonic profiles-->COMPUTE-->(
                                /
                                duration :
                                profile  :
                                :
                                energy   :
                                /profile :
                                : = MODE 1 voice
                                :
                                :
                                \
                                waveform :
                                segments  :
                                (32)     :

```

COMPUTE COMMAND - MODE 4:

```

harmonic profiles-->COMPUTE-->
                                waveform :
                                segments  : = MODE 4 voice
                                (128)     :

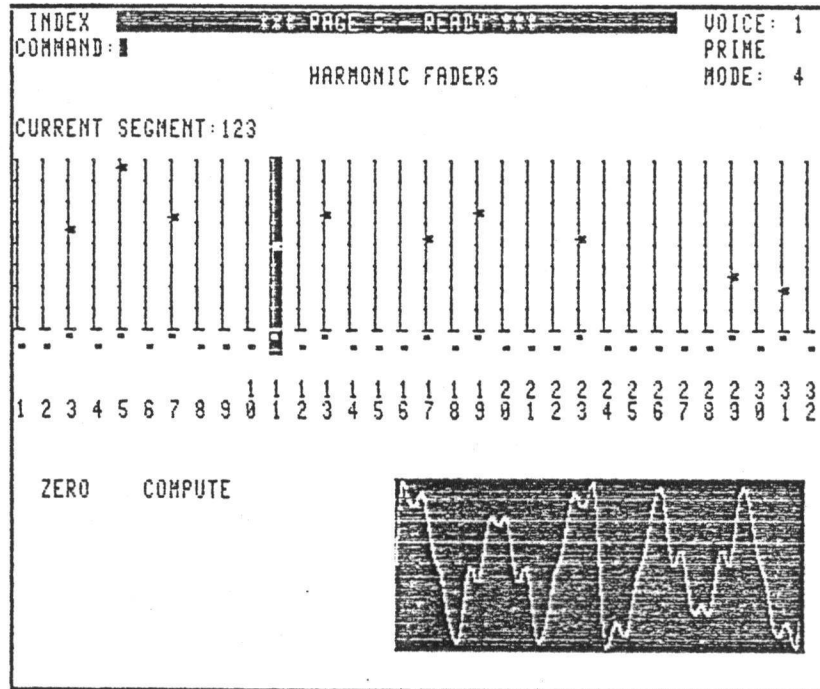
```

SCALE COMMAND (MODE 1 only):

```

energy profile-->SCALE-->
                                amplitudes
                                of harmonic
                                profiles.

```



1. HARMONIC amplitude faders
2. CURRENT segment selection
3. ZERO all harmonic faders
4. FILL other segments
5. COMPUTE waveform
6. SELECT any loaded voice
7. LOAD/SAVE instrument and voice files

PAGE 5 Harmonic Amplitude Faders

This page displays the harmonic overtone series as a set of 32 faders, similar to a graphic equalizer. Extremely precise control of harmonic amplitude can be achieved, enabling the application of Fourier-type harmonic series. For example, a square wave can be made from sine waves. Each "time slice" of the total waveform can have its own unique harmonic structure.

\*\*\*\*\*
\*\* 1. HARMONIC amplitude faders \*\*
\*\*\*\*\*

HARMONIC AMPLITUDE FADERS control the relative amplitudes of 32 HARMONICS for individual WAVEFORM SEGMENTS. The COMPUTE command mathematically processes these to generate the implied waveform in the WAVEFORM MEMORY by ADDITIVE SYNTHESIS. The PROFILE GRAPH of PAGE 4 and the FADERS of PAGE 5 thus have similar functions; in fact any change in harmonic amplitudes on either of these pages will be reflected on the other since both are dealing with the SAME harmonics. Any loaded VOICE may be selected. PAGE 5 may be used in either MODE 1 or MODE 4. See PAGE 4 HELP for more about WAVEFORM SEGMENTS and MODE.

TO SET a HARMONIC FADER with LIGHTPEN touch desired fader with LIGHTPEN and position as required.

TO SET a HARMONIC FADER by ASSIGNMENT use <arrow> keys or LIGHTPEN to TAB to desired fader, TYPE: n<set>
where: n = 0 - 255

\*\*\*\*\*
\*\* 2. CURRENT segment selection \*\*
\*\*\*\*\*

TO SELECT CURRENT WAVEFORM SEGMENT use <arrow> keys or LIGHTPEN to TAB to CURRENT SEGMENT, TYPE: n<set>
where: n = segment number

Maximum segment numbers are: 32 in MODE 1 and 128 in MODE 4. The FADERS and WAVEFORM for the segment will be displayed.

\*\*\*\*\*
\*\* 3. ZERO all harmonic faders \*\*
\*\*\*\*\*

TO ZERO ALL HARMONIC FADERS TYPE: LIGHTPEN:
Z<return> <ZERO>

All HARMONICS for the current segment will be set to ZERO. No change will occur to the waveform until the COMPUTE command is given.



```
*****
**                               **
** 6. SELECT any loaded voice  **
**                               **
*****
```

TO SELECT any loaded VOICE for display or modification,  
 TYPE: V,filename<return> or: V,n<return>

where: filename = the name of a loaded voice  
       n = the number 1-8 of a loaded voice

EXAMPLES: V,TUBA<return> - select voice TUBA  
           V,4<return>   - select voice 4

The NAME, NUMBER & MODE of the current voice are shown in the upper-right corner of the page. The names and numbers of all loaded voices are shown on PAGE 3.

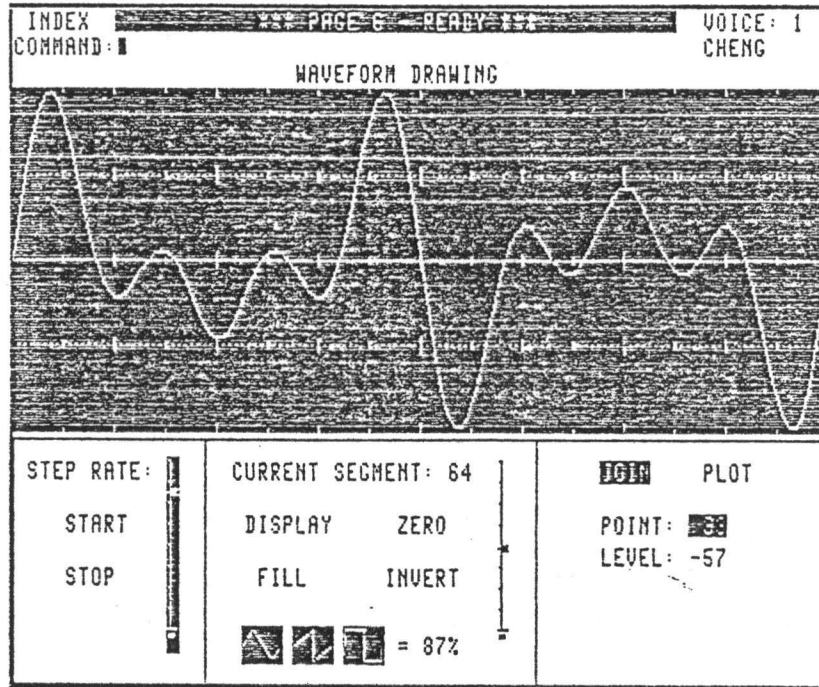
```
*****
**                               **
** 7. LOAD/SAVE instrument and voice files **
**                               **
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS TYPE:

To LOAD a VOICE	-	L,r,filename<return>
To SAVE a VOICE	-	S,filename<return>
To CREATE a VOICE	-	C,r,filename<return>
To LOAD an INSTRUMENT	-	L,filename.IN<return>
To SAVE an INSTRUMENT	-	S,filename.IN<return>

where: r = register A - H  
       filename = 1-8 character filename

See PAGE 3 HELP for more about loading/saving files.



1. WAVEFORM GRAPH
2. CURRENT SEGMENT assignment
3. DISPLAY command
4. START/STOP stepping display
5. LIGHTPEN waveform modification
6. POINT/LEVEL waveform modification
7. JOIN/PLOT switch
8. ZERO command
9. INVERT command
10. TRADITIONAL waveform generation
11. FILL command
12. GAIN command
13. MERGE command
14. MIX command
15. ROTATE command
16. REFLECT command
17. REVERSE command
18. TRANSFER command
19. ADD command
20. VOICE selection
21. LOAD/SAVE instrument and voice files



P A G E 6    W a v e f o r m   G r a p h

Page 6 is a close-up display of the actual digital waveform of the voice in the C.M.I.'s memory. Electronically derived sounds, and naturally derived ("sampled") sounds can both have their waveforms redrawn by the typewriter or the lightpen. All the traditional analog waveforms are here as well: triangle, sawtooth, squarewave (with pulsewidth adjustment).

On Page 6 you can reverse, reflect, merge, mix, add, transfer, fill, rotate left and right, invert and zero waveforms. This can be done to any degree down to 1/16384 of the waveform. Again, extremely tight control can be achieved in a matter of seconds. The computer can merge or mix small changes over the complete sound.

```
*****
**                                     **
**      1. WAVEFORM GRAPH            **
**                                     **
*****
```

THE WAVEFORM GRAPH displays one SEGMENT (128 points) of the WAVEFORM MEMORY of a voice as an oscilloscope-like image. Any segment or range of segments may be displayed. Waveforms can be created or altered either by drawing on the graph with the LIGHTPEN or by assigning LEVELS to individual waveform points. Horizontal divisions mark 1, 8 and 16 point intervals across the graph. Any loaded VOICE may be SELECTED for display or modification. The voice may be in either MODE 1 or MODE 4, but remember that in MODE 1 the amplitude envelope is specified with the ENERGY profile on PAGE 4. See PAGE 4 HELP for more about waveform memory, segments and voice mode.

The DISPLAY and FILL functions are exact opposites of each other. The DISPLAY function refers to the moving of a waveform segment INTO the GRAPH; the FILL function refers to the moving of the waveform displayed on the graph INTO a WAVEFORM SEGMENT. This allows a segment to be displayed and then modified to any degree without losing the original (which remains unaltered in waveform memory) until the segment is filled with the waveform displayed on the graph. Thus the graph is a kind of scratch-pad for waveform development. The features of PAGE 6 fall into two groups: those which directly modify the waveform memory of the voice, and those which change only the displayed waveform and thus require you to use the FILL command before the voice will actually be modified.

```
*****
**                                     **
**      2. CURRENT SEGMENT assignment **
**                                     **
*****
```

TO SET CURRENT SEGMENT NUMBER use <arrow> keys or LIGHTPEN to TAB to CURRENT SEGMENT, TYPE: s<set>

where: s = waveform segment number, range 1 - 128

The selected segment of WAVEFORM MEMORY will be DISPLAYED on the waveform graph. This is now the CURRENT SEGMENT.

```
*****
**                                     **
**      3. DISPLAY command           **
**                                     **
*****
```

<u>TO DISPLAY a WAVEFORM SEGMENT</u>	<u>TYPE:</u>	<u>LIGHTPEN:</u>
display current segment	- D<return>	<DISPLAY>
display segment (s)	- D,s<return>	n/a
display segment (s) thru (e)	- D,s,e<return>	n/a
display ALL segments	- D,*<return>	n/a

where: s e = segment numbers, range 1 - 128

EXAMPLES: D,24<return>     Display segment 24  
           D,1,16<return>    Display segments 1 thru 16

If only 1 segment number is specified (as in 1st example) the waveform segment is displayed and becomes the new CURRENT SEGMENT. If a RANGE of segments is specified they will be displayed sequentially, called a STEPPING DISPLAY, at a speed set by the STEP RATE fader. The LAST segment of the range will be the new current segment. If no segments are specified with the command, the current segment will be re-displayed. Note that any modifications to the displayed waveform that have not been FILLED will be lost.

TO USE CURRENT SEGMENT FADER touch fader with the LIGHTPEN and position as desired. Any segment may be DISPLAYED by movement of this fader (located to right of current segment number).

```
*****
**                                     **
**      4. START/STOP stepping display **
**                                     **
*****
```

<u>TO START/STOP STEPPING DISPLAY</u>	<u>TYPE:</u>	<u>LIGHTPEN:</u>
start display (when stopped)	- S<return>	<START>
stop display (when in progress)	- S<return>	<STOP>

If a STEPPING DISPLAY is in progress, you may STOP it whenever desired. The last segment displayed will be the new CURRENT SEGMENT. Alternatively, you may START a stepping display at any time which will proceed from the CURRENT SEGMENT to the last segment (128). The STEP RATE fader sets the time for which each segment is displayed, and can be adjusted by positioning it with the LIGHTPEN (even while stepping display in progress). A stepping display may also be STOPPED by pressing <ctrl-esc>.

(Press & hold <ctrl> - press <esc> ).

```
*****
**                                     **
**      5. LIGHTPEN waveform modification      **
**                                     **
*****
```

TO CREATE or MODIFY DISPLAYED WAVEFORM with LIGHTPEN simply draw on the WAVEFORM GRAPH with the lightpen. When drawing, the best accuracy will be usually be obtained by triggering the lightpen with a single quick "blip" of the finger rather than with a prolonged touch. However, large flowing shapes are best drawn by selecting JOIN (see JOIN/PLOT switch) and using a prolonged trigger. Remember, the waveform graph is a scratch pad: the FILL command MUST be used to move whatever is drawn into WAVEFORM MEMORY before it becomes part of the voice (and can be heard or saved). A good way to explore PAGE 6 is to put a LOOP (PAGE 4 or 7) in segment 1 of a MODE 4 voice. Then simply draw, touch <FILL> and play your creation.

```
*****
**                                     **
**      6. POINT/LEVEL waveform modification      **
**                                     **
*****
```

TO CREATE or MODIFY DISPLAYED WAVEFORM with POINT/LEVEL use <arrow> keys or LIGHTPEN to TAB to POINT / LEVEL, TYPE: n<set>  
 where: n = for POINT: desired point in segment, 1 - 12  
           for LEVEL: desired amplitude, -128 - 127

The LEVEL value will ALWAYS show the amplitude of the single point of the waveform segment indicated by POINT (even during a stepping display). When you tab to either LEVEL or POINT a marker appears on the WAVEFORM GRAPH to identify the selected point. Select desired POINT and then set LEVEL to modify the displayed waveform. Note that the WAVEFORM MEMORY is NOT affected until the FILL command is used. See JOIN/PLOT

```
*****
**                                     **
**      7. JOIN/PLOT switch      **
**                                     **
*****
```

THE JOIN/PLOT SWITCH selects the way in which the WAVEFORM GRAPH responds to alteration by the LIGHTPEN or assignment to LEVEL. There are 128 points in the displayed waveform. Both the level control and lightpen work by setting the amplitudes of single points. However, when JOIN is selected each subsequent alteration will be JOINED to the last by a straight line (the points between are set automatically). If PLOT is selected each point can be individually altered without affecting the others. JOIN is good for creating waveforms or large-scale alterations. PLOT is better for fine detail.

<u>To SELECT JOIN or PLOT</u>	TYPE:	LIGHTPEN:
select JOIN	- J<return>	<JOIN>
select PLOT	- P<return>	<PLOT>



```
*****
**                                     **
**      11. FILL command              **
**                                     **
*****
```

TO FILL WAVEFORM SEGMENT(S) with DISPLAYED WAVEFORM

	TYPE:	LIGHTPEN:
fill the current segment	- F<return>	<FILL>
fill segment (s)	- F,s<return>	n/a
fill segments (s) thru (e)	- F,s,e<return>	n/a
fill ALL segments	- F,*<return>	n/a

where: s e = segment numbers, range 1 - 128

EXAMPLES: F,68<return>      Fill segment 68  
 F,119,127<return>      Fill segments 119 thru 127

The DISPLAYED waveform is moved into the selected segment(s) of WAVEFORM MEMORY for the current voice. Modifications made to the displayed waveform by: LIGHTPEN drawing

POINT/LEVEL assignment

ZERO and INVERT commands do not affect the waveform memory (sound) of the voice until the FILL command is used. Before FILLED, these modifications exist only on the WAVEFORM GRAPH and are discarded if you display another segment or select another display page. When FILLED, the changes become part of the voice - the previous content of the FILLED segment(s) is gone and can only be restored by LOADING the voice again.

```
*****
**                                     **
**      12. GAIN command              **
**                                     **
*****
```

TO MODIFY AMPLITUDE (GAIN) OF SEGMENT(S) TYPE:

modify current segment	- G,p<return>
modify segment (s)	- G,p,n<return>
modify segments (s) thru (e)	- G,p,s,e<return>
modify ALL segments	- G,p,*<return>

where: p = desired GAIN as a PERCENTAGE  
 s e = segment numbers, range 1 - 128

EXAMPLES: G,50<return>      Gain 50% for current segment  
 G,110,4<return>      Gain 110% for segment 4  
 G,33,10,64<return>      Gain 33% for segments 10 thru 64  
 G,200,\*<return>      Gain 200% for all segments

The AMPLITUDE of the selected segment(s) of WAVEFORM MEMORY is modified according to the GAIN specified. 50% will halve the amplitude and 200% will double it.



EXAMPLES:

```
MI,1,8<return>   Mix from segment 1 to segment 8
MI,48,5<return>  Mix from segment 48 to segment 5
MI,-32<return>   Mix from current seg-32 to current seg
MI,+60<return>   Mix from current seg+60 to current seg
```

Like the MERGE command, this will generate a "crossfade" between the 2 segments - there must be at least one segment in between. The START segment (1st number specified) and END segment (2nd number specified) are not affected.

The WAVEFORM MEMORY of each segment in between will contain a MIX of the existing waveform of the segment (decreasing) and that of the END segment (increasing). The start segment number can be GREATER than the end segment. Mixing from 1-128 will take about 20 seconds.

```

                (fading out).....
Start segment, next seg, next seg, next seg,
                .....(fading in)                End segment
```

```
*****
**      15. ROTATE command      **
**      *****                **
*****
```

TO ROTATE ENTIRE WAVEFORM MEMORY      TYPE:

```
rotate right 1 point                    - ROR<return>
rotate right (s) segments               - ROR,s<return>
rotate right (s) segs & (p) points - ROR,s,p<return>
rotate left (just the same, but use: ROL instead of ROR)
    where: s = segment number, range 1 - 128
          p = point (byte) number, range 1 - 128
```

EXAMPLES:

```
ROR,1<return>            Rotate right 1 segment
ROL,8,32<return>        Rotate left 8 segments and 32 points
ROR,0,2<return>         Rotate right 2 points (zero segments)
```

The entire WAVEFORM MEMORY of the voice will be ROTATED RIGHT or LEFT as desired. Consider the first example above which specifies a ROTATE RIGHT of 1 segment. This will cause segment 1 to be moved to segment 2, segment 2 to segment 3, and so on. This procedure will "wrap-around" - meaning that segment 128 will be moved to segment 1 (hence the name ROTATE). If a ROTATE RIGHT of 2 points is requested (3rd example), point 1 will be moved to point 3, point 2 to 4, point 16,383 to point 1, and point 16,384 to point 2. (There are 16,384 points: 128 segs with 128 points each.) See TABLE below. This can be used to trim the start of an externally sampled voice, or (with use of the TRANSFER and ADD commands) to generate "doubling" or phase cancellation/reinforcement effects.



```
*****
**                               **
**      16. REFLECT command      **
**                               **
*****
```

TO REFLECT WAVEFORM MEMORY                   TYPE:

reflect around segment 64 point 1       - REF<return>  
 reflect around segment (s) point 1     - REF,s<return>  
 reflect around segment (s) point (p)   - REF,s,p<return>

where: s = segment number, range 1 - 128  
        p = point (byte) number, range 1 - 128

EXAMPLES: REF,14<return>     Reflect around seg 14 point 1  
           REF,32,64<return>  Reflect around seg 32 point 64

The WAVEFORM MEMORY is symmetrically REFLECTED around the specified point - points preceding the reflection point are repeated after it in reverse order. See table below.

```
*****
**                               **
**      17. REVERSE command      **
**                               **
*****
```

TO REVERSE ENTIRE WAVEFORM MEMORY   TYPE: REV<return>

The entire WAVEFORM MEMORY is completely REVERSED end-for-end. This table illustrates the effects of the REVERSE, ROTATE and REFLECT commands by using the alphabet to represent WAVEFORM MEMORY of a voice. Letters represent single waveform POINTS.

<u>original "waveform":</u>	ABCDEFGHIJKLMN <u>OP</u> QRSTUVWXYZ
REVERSED:	ZYXWVUTSRQPONMLKJI <u>HGF</u> EDCBA
ROTATED RIGHT 6:	UVWXYZABCDEFGHIJKLMN <u>OP</u> QRST
ROTATED LEFT 4:	EFGHIJKLMN <u>OP</u> QRSTUVWXYZABCD
REFLECTED AROUND G:	ABCDEF <u>GG</u> FEDCBAHIJKLMN <u>OP</u> QRS

```
*****
**                               **
**      18. TRANSFER command     **
**                               **
*****
```

TO TRANSFER SEGMENT(S) from another VOICE   TYPE:

transfer current segment from voice (v)   - T,v<return>  
 transfer segment (s) from voice (v)     - T,v:s<return>  
 transfer segments (s) to (e) from voice (v) - T,v:s,e<return>  
 transfer ALL segments from voice (v)     - T,v:\*<return>

where: v = name or number (1-8) of any loaded voice  
        s e = segment numbers, range 1 - 128

EXAMPLES:

T,FUDGE<return>    Transfer current seg from voice FUDGE  
 T,FUDGE:16<return> Transfer segment 16 from voice FUDGE  
 T,2:16,100<return> Transfer segments 16 to 100 from voice 2  
 T,4:\*<return>      Transfer ALL segments from voice 4

The selected segment(s) will be TRANSFERRED from the specified voice to the current voice. It is often handy to create a scratch voice for temporary storage of waveform segments while developing sounds on PAGE 6. To place segments into the scratch voice, SELECT it as the current voice and TRANSFER from the voice you are developing. Remember that the current voice (shown in upper-right) will always be the RECEIVER of the transferred segments.

```
*****
**                               **
**   19.  ADD command           **
**                               **
*****
```

TO ADD IN SEGMENTS(S) from another VOICE

add in current segment from voice (v)    - A,v<return>  
 add in segment (s) from voice (v)      - A,v:s<return>  
 add in segments (s) to (e) from voice (v) - A,v:s,e<return>  
 add in ALL segments from voice (v)     - A,v:\*<return>

where:    v = name or number (1-8) of any loaded voice  
           s e = segment numbers, range 1 - 128

EXAMPLES:

A,FUDGE<return>      Add in current seg from voice FUDGE  
 A,FUDGE:16<return> Add in segment 16 from voice FUDGE  
 A,2:16,100<return> Add in segments 16 to 100 from voice 2  
 A,4:\*<return>      Add in ALL segments from voice 4

The ADD command allows segment(s) of two voices to be blended. The WAVEFORM MEMORY of the currently selected voice will be modified to contain an equal mix of the waveforms already in the specified segments and those from the selected voice. An interesting operation involves the combined use of the TRANSFER, ROTATE, and ADD commands to achieve "doubling". Use TRANSFER to move all segments to another (scratch) voice and then ROTATE it RIGHT by some amount (say, 48 points) thus DELAYING it. Now reselect original voice and ADD all segments back in. Experiment with different rotation (delay) factors. This works best in best in MODE 4.

```
*****
**                               **
**   20.  VOICE selection       **
**                               **
*****
```

TO SELECT any loaded VOICE for display or modification,

TYPE:    V,filename<return>    or:    V,n<return>

where:    filename = the name of a loaded voice  
           n        = the number 1-8 of a loaded voice

EXAMPLES: V,TUBA<return> Select voice TUBA  
          V,4<return>     Select voice 4

The NAME and NUMBER of the current voice are shown in the upper-right corner of the page. The names and numbers of all loaded voices are shown on PAGE 3.

```
*****  
**  
** 21. LOAD/SAVE instrument and voice files **  
**  
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS TYPE:

To LOAD a VOICE           - L,r,filename<return>  
To SAVE a VOICE           - S,filename<return>  
To CREATE a VOICE         - C,r,filename<return>  
To LOAD an INSTRUMENT    - L,filename.IN<return>  
To SAVE an INSTRUMENT    - S,filename.IN<return>

where:     r = register A - H  
          filename = 1-8 character filename

See PAGE 3 HELP for more about loading/saving files.

```

INDEX *** PAGE 7 - READY *** VOICE: 7
COMMAND: 0 NIGHT

CONTROL PARAMETERS

CONTROL FILE: NIGHT .CO

MODE = 4      GLISSANDO = SWTCH1  LOOP CNTRL = SWTCH2
EXP = OFF    PORTAMENTO = SWTCH5  LOOP START = CNTRL3
LEVEL = KEYVEL  SPEED = CNTRL5  LOOP LNPTH = 113
FILTER = 19    CONST TIME = SWTCH3  START SEG = CNTRL2

DAMPING = CNTRL1  VIB DEPTH = CNTRL6      SLUR = SWTCH5
ATTACK = KEYVEL  VIB SPEED = CNTRL4    SUSTAIN = SWTCH4

VOICES:


|       |        |              |          |
|-------|--------|--------------|----------|
| SNARE | BASSDR | HIHAT        | JINGBELL |
| WOOD  | CABASA | <b>NIGHT</b> |          |



CNTRL: 1 2 3 4 5 6    SWTCH: 1 2 3 4 5
ON OFF ZERO          KEYVEL
    
```

1. CONTROL parameters
2. CONTROLS/SWITCHES on keyboard
3. KEY-VELOCITY function
4. ASSIGN to CONTROL parameters
5. CONTROL filename
6. LINK CONTROL FILE to VOICE
7. SAVE/LOAD CONTROL file
8. QUICK REFERENCE for ranges & patches
9. MODE
10. LEVEL/FILTER
11. DAMPING/ATTACK
12. GLISSANDO/PORTAMENTO
13. VIBRATO
14. LOOP
15. START/SLUR
16. SUSTAIN
17. SELECT any loaded VOICE
18. RESET all CONTROL parameters

PAGE 7 Control Parameters

This page features the usual controls associated with processing sound. These include: level (volume), touch-sensitive level, attack, touch-sensitive attack, damping, glissando, portamento, vibrato, slur, sustain, loop length, loop start, filter, mode (electronic or natural). Each of the eight voices loaded can have its own unique control settings, which are saveable. Six real-time faders and five real-time switches are available here and are patchable to most of the parameters. Three faders and two switches are on the left-hand side of the music keyboard. The other faders (or footpedals) and switches are accessible by Cannon-type connectors on the rear of the music keyboard.

```
*****
**          1. CONTROL PARAMETERS          **
**          *****                          **
*****
```

THE CONTROL PARAMETERS displayed on PAGE 7 consist of a number of operational and expressive factors which can be selected, adjusted or patched independently for any loaded VOICE. They are arranged as a table of variables for assignment. Either the <arrow> keys or LIGHTPEN can be used to TAB to the value of each parameter. A new value may be assigned according to the TYPE of the parameter -

CONTROL TYPE: Discretely variable, or "sliding". May be assigned a number or patched to a CONTROL.

SWITCH TYPE: Two-state, or "on/off". May be set either "ON" or "OFF", or patched to a SWITCH.

```
*****
**          2. CONTROLS/SWITCHES on keyboard  **
**          *****                          **
*****
```

THE KEYBOARD CONTROLS and SWITCHES on the MASTER KEYBOARD (and optional FOOTPEDALS) correspond directly to the two types of control parameters - sliding and on/off. Any control parameter (except two) may be patched to a "device" of the matching type by assigning one of the following names:

devices	names
Keyboard controls	= CNTRL1,CNTRL2,CNTRL3
Keyboard switches	= SWTCH1,SWTCH2
Footpedals	= SWTCH3,SWTCH4,SWTCH5
3 extra controls	= CNTRL4,CNTRL5,CNTRL6

(for MCL - PAGE C)

```
*****
**                                     **
**      3. KEY-VELOCITY function      **
**                                     **
*****
```

KEY VELOCITY is computed by the music keyboard for each key that is played. The LEVEL and ATTACK control parameters can both be patched to the KEY VELOCITY function for touch control of the voice's volume and (in MODE 4) attack time.

```
*****
**                                     **
**      4. ASSIGN to CONTROL parameters **
**                                     **
*****
```

ASSIGN TO CONTROL PARAMETERS by FIRST using <arrow> keys or LIGHTPEN to TAB to desired item; THEN type or use lightpen as indicated below to make assignments. The LIGHTPEN "targets" are located in a MENU at the bottom of the display page.

<u>To SET value of CONTROL-TYPE</u>	<u>TYPE:</u>	<u>LIGHTPEN:</u>
	n<set>	<ZERO>
where: n = number - numeric assignment (see PAGE 1 HELP)		
<u>To SET SWITCH-TYPE ON or OFF</u>	<u>TYPE:</u>	<u>LIGHTPEN:</u>
	ON<set>	<ON>
	OFF<set>	<OFF>
<u>To PATCH</u>	<u>TYPE:</u>	<u>LIGHTPEN:</u>
CONTROL number (c) -	CNTRLc<set>	<CNTRL:c>
SWITCH number (s) -	SWTCHs<set>	<SWTCH:s>
KEY VELOCITY -	KEYVEL<set>	<KEYVEL>
where: c = CNTRL number 1-6	Examples: CNTRL2<set>	
s = SWTCH number 1-5	SWTCH4<set>	

```
*****
**                                     **
**      5. CONTROL filename          **
**                                     **
*****
```

A CONTROL FILE (.CO suffix) can be SAVED on the RH disk to preserve the setup of the control parameters for a voice. By LOADING the file, all settings and patches will be restored. A control file can be LINKED to a voice, causing it to be loaded automatically whenever that voice is loaded.

TO SET CONTROL FILENAME for current VOICE use <arrow> keys or LIGHTPEN to TAB to CONTROL FILE, TYPE: filename<set>

where: filename = 1-8 character filename (see PAGE 2 HELP)

This effectively assigns a name to the displayed setup of the control parameters. When a VOICE is saved or the LNK command is used, this name is saved as part of the voice file. If the name is not blank, loading the voice will cause the CONTROL FILE of that name to be loaded also - the control file is thus LINKED to the voice.

TO SET BLANK CONTROL FILENAME TYPE: <space><set>

where: <space> = a space, i.e. " "

```
*****  
**  
** 6. LINK CONTROL file to VOICE **  
**  
*****
```

TO LINK CONTROL FILENAME to current VOICE TYPE: LNK<return>

This writes the displayed CONTROL FILENAME to the VOICE FILE for the currently selected voice (like saving just this part of the voice). To UNLINK a control file, LINK a blank name.

```
*****  
**  
** 7. SAVE/LOAD CONTROL file **  
**  
*****
```

TO SAVE CONTROL FILE TYPE:

to use displayed CONTROL FILENAME - S,CO<return>  
to assign new CONTROL FILENAME - S,CO,filename<return>  
where: filename = 1-8 character filename (see PAGE 2 HELP)

EXAMPLE:

S,CO,PLUCK<return> Save PLUCK.CO - new CONTROL FILENAME

The setup of all CONTROL PARAMETERS for the selected voice will be SAVED in a CONTROL FILE. If no filename is specified then the displayed CONTROL FILENAME will be used: Note that if the file already exists on the disk, it will be OVERWRITTEN.

TO LOAD CONTROL FILE TYPE:

to use CONTROL FILENAME - L,CO<return>  
to set new CONTROL FILENAME - L,CO,filename<return>  
where: filename = 1-8 character filename (see PAGE 2 HELP)

EXAMPLE:

L,CO,TRUMP<return> Load TRUMP.CO - new CONTROL FILENAME

If no filename is specified then the displayed CONTROL FILENAME will be used. The setup of the CONTROL PARAMETERS at the time the file was last SAVED will be completely restored.



```
*****
**      8. QUICK REFERENCE for ranges & patches **
*****
```

QUICK REFERENCE CHART shows ranges and possible patches for each control parameter.

Control Parameter	Range:	Patch:		
MODE	1,4			
EXP	ON,OFF	S	S:	SWTCH1-5
LEVEL	0-255	C K	C:	CNTRL1-6
FILTER	1-15		K:	KEYVEL
DAMPING	0-65535	C		
ATTACK	0-16383	C K		
GLISSANDO	ON,OFF	S		
PORTAMENTO	ON,OFF	S		
SPEED	0-127	C		
CONSTANT TIME	ON,OFF	S		
VIBRATO DEPTH	0-127	C		
VIBRATO SPEED	0-127	C		
LOOP CONTROL	ON,OFF	S		
LOOP START	1-128	C		
LOOP LENGTH	0-128	C		
START SEGMENT	1-128	C		
SLUR	ON,OFF	S		
SUSTAIN	ON,OFF	S		

```
*****
**      9. MODE **
*****
```

MODE            range: 1 or 4            patch: (n/a)

This selects either of two modes of operation for the OUTPUT CHANNELS allocated to the voice.

MODE 1: 32 waveform segments are utilized. ENERGY and DURATION profiles on PAGE 4 determine the amplitude/duration characteristics of the voice. ATTACK control parameter is not active.

Usually chosen for voices which are to SYNTHESIZED from HARMONICS on PAGE 4.

MODE 4: 128 waveform segments are utilized. Amplitude is a direct function of individual segment waveform amplitudes. ATTACK control parameter is active. Should always be used when EXTERNAL SAMPLING is being performed on PAGE 8 and is usually chosen for voices to be SYNTHESIZED with combined facilities of PAGES 5 and 6.

Voice MODE may also be changed on PAGE 3 for convenience when CREATING voices. See also PAGE 4 HELP for more about WAVEFORM SEGMENTS and MODE.

EXP range: ON,OFF patch: SWTCH

Not active in standard systems. Provided for optional hardware feature only. (See manual provided with hardware unit.)

```
*****
**          **
** 10. LEVEL/FILTER **
**          **
*****
```

LEVEL range: 0-255 patch: CNTRL,KEYVEL

This is the VOLUME control for the voice. Setting LEVEL to zero will mute the voice completely. Note that this parameter may be patched to KEY VELOCITY for touch-sensitive control of voice dynamics. Both the KEYBOARD SEQUENCER - PAGE 9 and the MCL - PAGE C provide the ability to program KEY VELOCITY for individual note volumes; to use this facility, LEVEL must be patched to KEYVEL on PAGE 7.

FILTER range: 1-15 patch: (n/a)

A LOW-PASS tracking filter which is used for attenuating any unwanted high-frequency content present in the voice; cutoff frequency is raised by increasing the value. If set to 15, the filter is bypassed completely. The filter is usually most effective at its default setting of 8, and should always be set to at least 8 when EXTERNAL SAMPLING is being performed on PAGE 8.

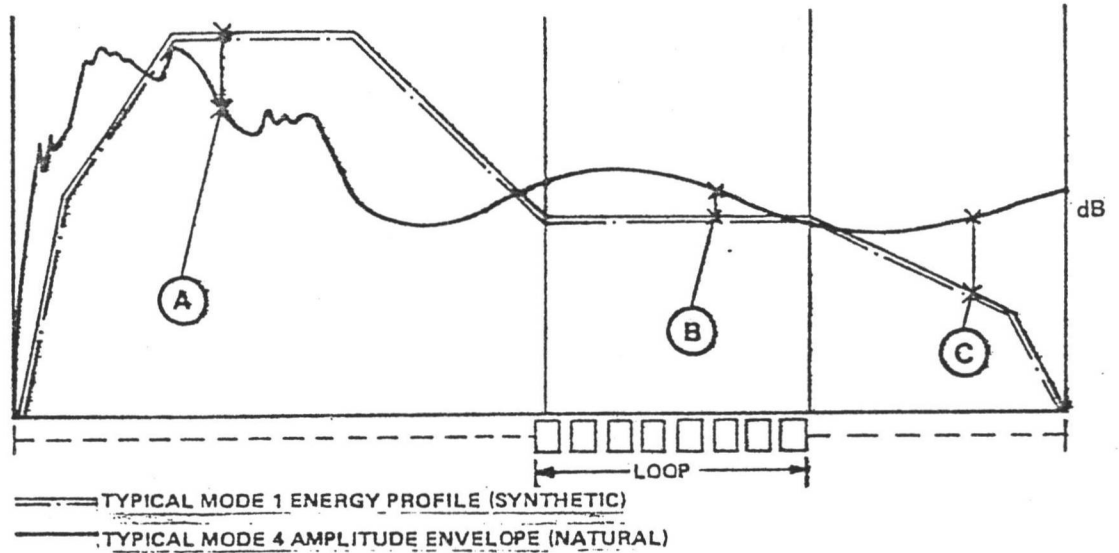
```
*****
**          **
** 11. DAMPING/ATTACK **
**          **
*****
```

DAMPING range: 0-65535 msec patch: CNTRL

Range is reduced to 16383 msec in MODE 4. This parameter is not active when SUSTAIN is ON. Provided SUSTAIN is off, the value determines the FINAL DECAY time of the voice (time from key release to silence). If a LOOP is active, the voice will "hang" in the loop for the specified time when key is released; otherwise the voice will continue through the remaining segments. If end of waveform is reached before DAMPING period expires then the voice will stop abruptly. Setting DAMPING to zero will usually cause a click at the end of the voice. See Figure 7a.

ATTACK range: 0-16383 msec patch: CNTRL,KEYVEL

This defines the ATTACK TIME for MODE 4 voices; not active in MODE 1. May be patched to KEY VELOCITY for touch-sensitive control of the attack time. Note that both the KEYBOARD SEQUENCER - PAGE 9 and the MCL - PAGE C can program key velocity for individual notes, thus allowing programmable attack time if ATTACK is patched to KEYVEL on PAGE 7.



RELEASE POINT	SUSTAIN STATE	WITHOUT LOOP	WITH LOOP
{A}	ON	All segments played. Key release point has NO EFFECT.	Same as with no loop. Loop is IGNORED.
	OFF	Amplitude begins ramping down for period specified by DAMPING until silence or the end segment is reached.	Amplitude begins ramping down for period specified by DAMPING. If this is sufficiently long, the voice will reach the loop & continue looping until silence is reached. Post loop segments are not played.
{B}	ON	as {A}	Loop becomes INACTIVE; amplitude begins ramping down for DAMPING period until silence or the end segment is reached.
	OFF	as {A}	Loop remains ACTIVE, and amplitude begins ramping down over DAMPING period (voice "hangs" in the loop). Post loop segments are not played.
{C}	ON	as {A}	Impossible (loop prevents voice from reaching this point).
	OFF	as {A}	Impossible.

[Figure 7a] TABLE OF RELEASE CONDITIONS

\*\*\*\*\*  
\*\* 12. GLISSANDO/PORTAMENTO \*\*  
\*\*\*\*\*

GLISSANDO range: ON,OFF patch: SWTCH

When ON, each channel allocated to the voice will produce a chromatic glissando between each new pitch it is to play and, the last pitch it played. The SPEED and CONSTANT TIME parameters determine the rate and type of the gliss. Usually patched to a KEYBOARD SWITCH or FOOT PEDAL.

PORTAMENTO range: ON,OFF patch: SWTCH

When ON, each channel allocated to the voice will produce a continuous portamento (glide) between each new pitch it is to play and the last pitch it played. The SPEED and CONSTANT TIME parameters determine the rate and type of the glide. Note that if GLISSANDO and PORTAMENTO are BOTH ON, PORTAMENTO will take precedence. This is usually patched to a KEYBOARD SWITCH or FOOT PEDAL.

SPEED range: 0-127 patch: CNTRL

This is the SPEED control for the GLISSANDO and PORTAMENTO functions. See also CONSTANT TIME below.

CONSTANT TIME range: ON,OFF patch: SWTCH

This switch allows selection of two types of GLISSANDO and PORTAMENTO. When ON, the same time is taken to travel any interval - the RATE of change alters according to the pitch distance (hence CONSTANT TIME). When OFF, the RATE of change remains fixed (determined by SPEED) and the time taken varies with the size of the interval. Usually patched to a KEYBOARD SWITCH or FOOT PEDAL.

\*\*\*\*\*  
\*\* 13. VIBRATO \*\*  
\*\*\*\*\*

VIB DEPTH range: 0-127 patch: CNTRL

Provides control of the depth of the vibrato function. Zero produces NO vibrato.

VIB SPEED range: 0-127 patch: CNTRL

Provides control of the rate of the vibrato cycle.

\*\*\*\*\*  
\*\* 14. LOOP \*\*  
\*\*\*\*\*

LOOP CONTROL range: ON,OFF patch: SWTCH

Set this switch ON to use any of the following LOOP CONTROL PARAMETERS. When OFF they are not active. The LOOP consists of a range of 1 or more waveform segments which are to played continuously for the duration of a key depression.

In MODE 1 the effect of the portion of the ENERGY PROFILE enclosed by the LOOP is CUMULATIVE; i.e., looping through a diminishing energy profile will quickly bring the amplitude to zero (see PAGE 4 HELP for more about this effect). See also SUSTAIN.

LOOP START range: 1-128 segment patch: CNTRL

This allows you to specify the number of the 1st segment of the LOOP. By patching this parameter and LOOP LENGTH to KEYBOARD CONTROLS extremely precise adjustments can easily be made to the loop position - even while sustaining the voice. If assigned a numeric value, modification of the loop on PAGE 4 will cause the assigned number to change accordingly.

LOOP LENGTH range: 0-128 segments patch: CNTRL

This determines the number of segments in the LOOP. If set to ZERO, the LOOP is removed completely. If assigned a numeric value, modification of the loop on PAGE 4 will cause the assigned length to change accordingly.

```
*****
**                               **
**      15.  START/SLUR         **
**                               **
*****
```

START SEG range: 1-128 segment patch: CNTRL

This control allows the STARTING SEGMENT of the voice to be modified; i.e., at what segment the voice will begin when activated by a key. Note that by patching LOOP START and START SEG to the same KEYBOARD CONTROL, the two parameters can be modified in parallel (most effective in MODE 4).

SLUR range: ON,OFF patch: SWTCH

If this switch is ON and there is a LOOP active, each channel will sustain infinitely in the LOOP until a new note is to played. At that time it will start the new note at the LOOP without playing any preceding segments. This can be very effective when patched to the same KEYBOARD SWITCH or FOOT PEDAL as the GLISSANDO or PORTAMENTO switches - allowing both SLUR and a glide function to be switched simultaneously.

```
*****
**                               **
**      16.  SUSTAIN           **
**                               **
*****
```

SUSTAIN range: ON,OFF patch: SWTCH

This switch determines the behaviour of the voice upon key release. When SUSTAIN is OFF, a key release causes the voice amplitude to begin decaying at a rate controlled by DAMPING. If there is a LOOP, the voice will continue looping until the DAMPING time has expired; otherwise it will continue playing the remaining segments until the end of the waveform is reached or the DAMPING time expires - whichever comes first.

When SUSTAIN is ON, DAMPING is ignored. The entire waveform is always played (all segments heard). If there is a LOOP, the voice will stop LOOPING and continue to the last segment with no decay in amplitude. See Figure 7a.

```
*****  
**                               **  
** 17. SELECT any loaded VOICE  **  
**                               **  
*****
```

TO SELECT any loaded VOICE TYPE: LIGHTPEN:  
V,voice<return> <voice>  
where: voice = the name OR number (1-8) of a loaded voice

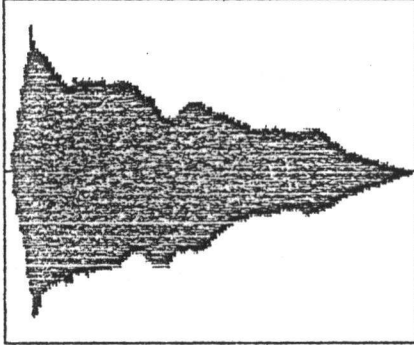
EXAMPLES: V,TUBA<return> - select voice TUBA  
V,4<return> - select voice 4

The names of all loaded voices are shown inside the box. When using LIGHTPEN, select voice by touching its name. The name and number of the current voice are shown in the upper-right corner of the page. The names and numbers of all loaded voices can be seen on PAGE 3.

```
*****  
**                               **  
** 18. RESET all CONTROL parameters **  
**                               **  
*****
```

TO RESET all CONTROL PARAMETERS TYPE: R<return>

This will reset all control parameters for the current voice to their default values. The CONTROL FILENAME is blanked. This reproduces the standard setup that is provided when a voice is CREATED (see PAGE 3 HELP). The MODE is not changed.

INDEX	<del>***PAGE 8 READY***</del>		VOICE: 1
COMMAND: 1			CHENG
SOUND SAMPLING			
SAMPLE RATE	30147 HZ	SAMPLE LEVEL	255
FILTER LOW	1	TRIGGER LEVEL	<del>255</del>
FILTER HIGH	9	TRIGGER DELAY	25914 MS
COMPRESSOR	OFF		
SAMPLE			
DISPLAY			

1. SOUND SAMPLING
2. SAMPLE RATE
3. FILTER LOW/HIGH
4. SAMPLE LEVEL
5. TRIGGER LEVEL
6. TRIGGER DELAY
7. SAMPLE EXTERNAL SIGNAL
8. DISPLAY AMPLITUDE
9. TABLE of SAMPLE RATES
10. SELECT any loaded VOICE
11. LOAD/SAVE INSTRUMENT and VOICE files



P A G E 8     S o u n d   S a m p l i n g

Realworld sounds can be "sampled" on this page either through the microphone input, the line input, or straight to the analog-to-digital converter in a matter of seconds. The sample rate can varied minutely over a wide range, meaning that even if the sound being sampled is not in tune, the C.M.I. will adjust. The new sound can then be played immediately over the whole range of the keyboard, perfectly in tune, and with 8 note polyphony. Make your favourite monophonic sound into octophonic sound with quartz-crystal controlled tuning. Because the new sound is now in digital memory, it can be modified. Low-pass and high-pass filters are adjustable to filter out unwanted frequencies. There is an output available at the back of the C.M.I. to monitor the effect of any filtering. To facilitate sampling, level adjustment and triggering controls are provided. After each sample, a sound envelope is displayed for quick monitoring of input levels.

```
*****
**          1. SOUND SAMPLING          **
**          *****                    **
*****
```

SOUND SAMPLING is the process of creating a CMI voice waveform by analogue to digital conversion of an external audio source. The source must be connected to the MIC IN or LINE IN socket on back panel and the input selection switch set accordingly.

A voice must be CREATED or LOADED and should be in MODE 4 and ready to play on the keyboard (see PAGE 3 ). A table of variables related to the sampling process occupies the top area of the display page. These may be selected for assignment by using the <arrow> keys or LIGHTPEN to TAB to the displayed value. To modify, type number followed by <set>, <add>, or <sub>key.

```
*****
**          2. SAMPLE RATE            **
**          *****                    **
*****
```

SAMPLE RATE            range: 2100 - 30200 Hz

This is the frequency at which the external signal is sampled and converted; thus determining two aspects of the sample:

1. BANDWIDTH (fidelity) of the sample IMPROVES with increasing SAMPLE RATE. Bandwidth is approximately equal to half the sampling frequency.
2. DURATION of the sample gets shorter with increasing SAMPLE RATE.

The number of individual samples taken is fixed - the number of POINTS in the WAVEFORM MEMORY, i.e. 16,384. The faster these samples are taken, the shorter the duration of the sound becomes.

The CORRECT setting of SAMPLE RATE is critical with pitched sounds since the voice will only be IN TUNE if ONE CYCLE of the resulting sampled waveform fits exactly into one SEGMENT of waveform memory. This is achieved when the SAMPLE RATE equals the frequency of the source multiplied by 128 (128 samples per cycle). The default setting (14080) is the correct sample rate for A=110 Hz. Usually a few test samples will need to be made to adjust the SAMPLE RATE correctly. PAGE D has been designed for viewing the sampled waveform to quickly determine the accuracy of the sample rate; see PAGE D HELP.

See also SAMPLE RATE TABLE.

```
*****
**          3. FILTER LOW/HIGH          **
**          *****                     **
*****
```

FILTER LOW/HIGH range: 1-9

These filters can be used as desired to remove unwanted high or low frequency components of the external source. The FILTER OUT socket on back panel allows the signal to be monitored after these filters. It is a good practice to set FILTER HIGH to cutoff at about half the SAMPLE RATE (since this is the bandwidth limit). Frequencies greater than this are only likely to contribute a "dirty" quality to the voice.

value	FILTER LOW cutoff	FILTER HIGH cutoff
1	18 Hz	0.6 KHz
2	26	0.8
3	37	1.0
4	52	2
5	73	3
6	104	4
7	147	6
8	208	8
9	294	12

#### COMPRESSOR

This is not active in standard systems; for use with optional hardware unit only (see instructions with unit).

```
*****
**          4. SAMPLE LEVEL          **
**          *****                     **
*****
```

SAMPLE LEVEL range: 0 - 255

The amplitude of the sampled waveform is determined by this control. It should be set so that the loudest section of the sound is neither CLIPPING or less than about 80% of full scale. The AMPLITUDE DISPLAY provided will indicate whether SAMPLE LEVEL should be increased or decreased.

```

*****
**          5. TRIGGER LEVEL          **
*****

```

TRIGGER LEVEL range: -128 - 127

This is the amplitude THRESHOLD at which the sampling process is triggered to begin. When the SAMPLE command is given the system will wait until this level is reached before proceeding. Note that a NEGATIVE value can be assigned if desired to cause triggering on a negative excursion of the signal.

```

*****
**          6. TRIGGER DELAY          **
*****

```

TRIGGER DELAY range: 0 - 65535 msec

If desired, this can be used to cause a DELAY after the TRIGGER has occurred. When sampling a taped source, a burst of tone can be recorded shortly before the signal to be sampled and used instead of the signal itself to TRIGGER the sampling process. TRIGGER DELAY can then be used to precisely define the point at which sampling will actually begin. This is extremely useful for sounds with airy, gentle attack characteristics.

```

*****
**          7. SAMPLE EXTERNAL SIGNAL **
*****

```

<u>TO SAMPLE EXTERNAL SIGNAL</u>	TYPE:	LIGHTPEN:
	S<return>	<SAMPLE>

If the TRIGGER LEVEL is too high or no signal is present the CMI will wait for about 15 seconds and finally give up with the message: TRIGGER TIMEOUT. If this occurs, check for signal - adjust TRIGGER LEVEL if necessary and try again. When the SAMPLE has completed the AMPLITUDE DISPLAY in lower-right will show the amplitude envelope of the waveform. If clipping or insufficient level can be seen adjust either SAMPLE LEVEL or source level accordingly. Use PAGE 6 for detailed inspection for clipping. Use PAGE D to assess the accuracy of SAMPLE RATE (see PAGE D HELP) or check TUNING of the new voice. If SHARP the SAMPLE RATE is too LOW.



```
*****  
** 11. LOAD/SAVE INSTRUMENT and VOICE files **  
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS TYPE:

To LOAD a VOICE - L,r,filename<return>  
To SAVE a VOICE - S,filename<return>  
To CREATE a VOICE - C,r,filename<return>  
To LOAD an INSTRUMENT - L,filename.IN<return>  
To SAVE an INSTRUMENT - S,filename.IN<return>

where: r = register A - H

filename = 1-8 character filename

See PAGE 3 HELP for more about loading/saving files.

```

INDEX STOP REPLAY
COMMAND: 1
                KEYBOARD SEQUENCER
REPLAY FILE: RED1 .SQ          DISK ID: BLANK
RECORD FILE: RED2 .SQ          FREE SPACE: 3072

SPEED: 43786      CLICK: OFF      KEYBOARD SELECTION
SYNC: EXT        RATE: 300        MASTER: 1
                                      SLAVE: 2

INPUT STREAM TO  1 2 3 4 5 6 7 8
KEYBOARD NUMBER: 1 2 3 4 5 6 7 8

REPLAY TRIM          CONTROLS & SWITCHES
HEAD: 312          RECORD: ON
TAIL: 0              REPLAY: ON

RECORD  STOP  REPLAY  MERGE
    
```

1. INTRODUCTION to keyboard sequencer
2. FREE space on disk
3. ASSIGN record & replay files
4. RECORD command
5. STOP command
6. REPLAY command
7. MERGE command
8. OVERWRITE protection
9. TRIM replay file
10. CONTROLS/SWITCHES recorded or replayed
11. KEYBOARD selection
12. INPUT STREAM to keyboard number table
13. SPEED control
14. SYNC selection: internal or external
15. CLICK control

P A G E 9    K e y b o a r d   S e q u e n c e r

Page 9 allows you to record music on the keyboard and record the settings of the 6 faders and 5 switches. Multiple overdubs can be achieved by "merging" subsequent recordings, that is replaying the first sequence whilst recording the new sequence. Keyboard performances can be played back at any speed without changing pitch, in fact, so fast that you can't distinguish individual notes or so slowly that you may think the C.M.I. has stopped playing altogether! Any sequence or sequences can be replayed immediately and continuously up to 256 times. It is possible to synchronize the C.M.I. to any external audio tone (usually recorded onto tape) to allow multi-track recording. The C.M.I. will then synchronize perfectly to that tone, slowing down as the pitch of the tone drops, speeding up as the pitch of the tone rises. Up to 50,000 notes can be stored on a blank disk. A completely adjustable "click" facility is provided so "live" musicians can play along. You may want to record the click track onto multi-track tape to gate or trigger other electronic devices. The click-track comes from a separate output on the C.M.I.

```
*****
**
** 1. INTRODUCTION to KEYBOARD SEQUENCER **
**
*****
```

**RECORD** When recording, music keyboard EVENTS are timed and stored on disk in a file created as the RECORD FILE. Events consist of KEY DEPRESSIONS (with VELOCITY), KEY RELEASES, and movements of the keyboard CONTROLS and SWITCHES. (See PAGE 7 HELP for use of controls, switches and key velocity.) The currently KEYBOARD SELECTION number for the master (or slave) keyboard is also recorded with key depressions and releases.

**REPLAY** To replay, a previously recorded sequence is selected as the REPLAY FILE, from which keyboard events are read back, timed and replayed. Key releases and depressions are sorted into eight INPUT STREAMS, corresponding to the recorded keyboard numbers. These input streams can be linked to any of the eight KEYBOARD NUMBERS through the INPUT STREAM TO KEYBOARD NUMBER table.

**MERGE** The merge function consists of recording and replaying at the same time. Keyboard events are recorded exactly as in the RECORD function while the replay file is replayed and simultaneously re-recorded in the record file. This allows a new keyboard performance to be effectively OVERDUBBED. The resulting sequence can then be selected as the REPLAY FILE and the process repeated.

DISK ID shows name of disk in RH drive.



```
*****
**                                     **
**      2. FREE SPACE on disk      **
**                                     **
*****
```

FREE SPACE shows size (in sectors) of LARGEST SINGLE BLOCK of free disk space on disk in RH drive. When a RECORD FILE is assigned all of this space is given to the new file. When recording (or merging) stops, any unused file space is returned to the disk; FREE SPACE then shows the size of the NEW largest single block. A 128-note sequence will require about 10 sectors of disk space. The maximum sequence size (an entire disk) is over 50,000 notes.

```
*****
**                                     **
**      3. ASSIGN record & replay files      **
**                                     **
*****
```

TO ASSIGN REPLAY or RECORD FILE

Use <arrow> keys to select replay or record filename.

TYPE: filename<set>

where: filename = 1-8 character filename without suffix.

When the REPLAY file is assigned the SPEED and CLICK rate are read from the file. When the RECORD file is assigned, the SPEED and CLICK rate are written to the file. The replay or record files may also be specified as part of the typed RECORD, REPLAY or MERGE commands. See also OVERWRITE PROTECTION.

```
*****
**                                     **
**      4. RECORD command      **
**                                     **
*****
```

TO RECORD A SEQUENCE

TYPE:

LIGHTPEN:

If record file assigned - REC<return>

<RECORD>

To also assign record file - REC,filename<return>

n/a

EXAMPLE: REC,BOTTOM<return> Record file = BOTTOM.SQ

A RECORD FILE must be assigned, either prior to or as part of the command. Recording begins when the word RECORD lights up. The KEYBOARD SELECTION number determines the INPUT STREAM with which the sequence will be associated when replayed. Play the music keyboard; give the STOP command when finished. Keyboard CONTROLS and SWITCHES will be recorded if not disabled. Note that the time from the BEGINNING until the FIRST event and the time from the LAST event until STOP are recorded (referred to as HEAD and TAIL times). The sequencer must be STOPPED before the RECORD command can be given. If the record file already exists, it will NOT be overwritten without your consent.



```
*****
**                               **
**      7. MERGE command        **
**                               **
*****
```

<u>TO MERGE A SEQUENCE</u>	TYPE:	LIGHTPEN:
If both files assigned	- M<return>	<MERGE>
To also assign replay file	- M,repfile<return>	n/a
To also assign both files	- M,repfile,recfile<return>	n/a
To repeat replay xx times	- M,xx<return>	n/a

where: repfile = replay filename  
       recfile = record filename  
       xx = replay repeat count: 2-255

EXAMPLES:

```
M<return>           Merge (current Replay and Record files)
M,BAS1,BAS2<return>  Replay file=BAS1.SQ; Record file=BAS2.SQ
M,SOLO,16<return>   Replay file=SOLO.SQ - replay it 16 times
M,S3,S4,8,<return>  Replay file=S3.SQ; Record file=S4.SQ -
                   replay 8 times
```

REPLAY and RECORD FILES must both be specified, either prior to or as part of the command. The replay file is replayed the specified number of times and simultaneously re-recorded in the RECORD FILE along with the new keyboard performance. Recording will continue after the end of the replay file until the STOP command is given. The INPUT STREAM TO KEYBOARD NUMBER table determines the keyboard numbers which will be recorded for the replay events. The sequencer must be STOPPED before the MERGE command can be given.

```
*****
**                               **
**      8. OVERWRITE protection  **
**                               **
*****
```

OVERWRITE PROTECTION

The sequencer will never OVERWRITE an existing RECORD file before displaying the question:

```
                  OVERWRITE filename.SQ (Y)?
TO REPLY:          TYPE:
Yes, overwrite the file - Y<return>
No, do NOT overwrite file - N<return> or just <return> or
                  <ctrl-esc>
```

```
*****
**                               **
**      9. TRIM replay file      **
**                               **
*****
```

TO TRIM REPLAY FILE HEAD/TAIL

Use <arrow> keys to TAB to HEAD or TAIL, TYPE: nnn<set>  
 where: nnn = time in MICROBEATS: 0 - 65535

A REPLAY FILE must be assigned. The HEAD TIME is the time from the beginning of the sequence to the 1st event. The TAIL TIME is the time from the last event to the end of the sequence. Head and tail time may be adjusted either when the sequencer is STOPPED or during REPLAY or MERGE. If the sequencer is STOPPED, the new head or tail time will be WRITTEN to the file. If the sequencer is in REPLAY or MERGE, the new times will only be used for the REMAINDER of the run. To obtain a smooth repeat, adjust these times while replaying.

When the replay file is repeating smoothly, STOP and reassign the final settings, thereby writing them to the file. HEAD time should usually be set to zero.

```
*****
**                                     **
**      10. CONTROL/SWITCHES recorded or replayed      **
**                                     **
*****
```

TO RECORD/REPLAY CONTROLS & SWITCHES

Use <arrow> keys to TAB to RECORD or REPLAY, TYPE:  
                   To ENABLE record/replay - ON<set>  
                   To DISABLE record/replay - OFF<set>

When RECORD is ON, any use of the keyboard CONTROL faders or SWITCHES (including foot pedals) will be recorded during RECORD or MERGE. When REPLAY is ON, any CONTROL or SWITCH events in the REPLAY file will be played during REPLAY or MERGE. Thus during MERGE, if RECORD is OFF and REPLAY is ON, control or switch events will be replayed, but NOT recorded.

Recording busy CONTROLS can require a lot of disk space.

```
*****
**                                     **
**      11. KEYBOARD selection      **
**                                     **
*****
```

TO SET KEYBOARD SELECTION

Use <arrow> keys to TAB to MASTER or SLAVE, TYPE: n<set>  
                   where: n = Keyboard number: 1 - 8

The K command available on every page can also be used to set the keyboard selection number (see PAGE 3 HELP). This number determines which of the 8 KEYBOARD MAPS on PAGE 3 is linked with the selected music keyboard. When using RECORD or MERGE to record a keyboard performance the keyboard selection number determines the INPUT STREAM with which that performance will be associated when REPLAYED. When using MERGE to overdub successive performances a different keyboard number is usually assigned at each pass to retain the integrity of the parts.

```
*****
**                               **
**  12. INPUT STREAM to keyboard number table  **
**                               **
*****
```

TO ASSIGN INPUT STREAM TO KEYBOARD NUMBER

Use <arrow> keys to TAB to desired INPUT STREAM.

TYPE: n<set>

where: n = Keyboard number: 0 - 8

This table allows each of the 8 INPUT STREAMS from the REPLAY FILE to be linked with any of the 8 KEYBOARD MAPS which are presented on DISPLAY PAGE 3. This allows you to specify which REGISTER will be "played" by each input stream by setting up the desired keyboard configuration on PAGE 3. Assigning a keyboard number of ZERO will turn OFF an input stream. Keyboard numbers may be assigned to input streams DURING replay or merge. During MERGE, this table determines the keyboard numbers which will be recorded for the replay events. Thus the input streams may be dynamically reassigned or turned off while merging, and the results will be saved in the RECORD FILE.

```
*****
**                               **
**  13. SPEED control           **
**                               **
*****
```

TO CHANGE SPEED use <arrow> keys to select SPEED.

TYPE: nnnn<set>                    or            TYPE: nn<add or sub>

where: nnnn = 1000-65535                    where: nn = 1-65535

The sequencer measures time in units called MICROBEATS. The SPEED control defines the DURATION of a microbeat as a number of system clock cycles (1.00525 MHz). Thus the TEMPO of the REPLAY sequence is the SAME as the recorded performance IF the speed setting is exactly the same. The tempo can be made FASTER by REDUCING the speed setting (shorter microbeats) or made SLOWER by INCREASING it (longer microbeats). While recording, the smallest time interval which can be measured is one microbeat. The RESOLUTION (rhythm accuracy) of the recording process is therefore governed by the SPEED:

$$\frac{\text{SPEED}}{1000} = \text{resolution in milliseconds (approx)}$$

When a sequence is recorded, the SPEED is stored in the file and will be automatically restored when the file is assigned as the REPLAY file. The speed may then be altered either before or DURING replay but this does not affect the setting stored in the file. See INTERNAL/EXTERNAL SYNC.

TO WRITE the CURRENT SPEED to the REPLAY FILE

TYPE:      SPEED<return>            or            SP<return>

```
*****
**      14. SYNC selection: internal or external  **
**      *****
```

TO SET INTERNAL/EXTERNAL SYNC use <arrow> keys to TAB to SYNC.

TO SELECT:	TYPE:
internal sync	- INT<set>
external sync	- EXT<set>
external sync (DIVIDE external tone by nn)	- nn<set>
where: nn = 2 - 65535	

When INTERNAL SYNC is selected (normal) the SPEED control defines the microbeat duration in cycles of the system clock as described. When EXTERNAL SYNC is selected, SPEED is ignored, and a microbeat becomes ONE CYCLE of the EXTERNAL SYNC INPUT (which must be connected at the back panel). This allows the replay tempo to be controlled by varying the external sync frequency. If a number "nn" is assigned to SYNC then a microbeat will be "nn" cycles of the external tone. The external sync facility can be used to co-ordinate multi-track overdubbing of sequences by taping the sync tone and using the "sync-head" replay from the recorder to feed the external sync input of the CMI.

The tone can be any periodic waveform between 100 Hz and 5 000 Hz. It should be around 1 volt peak-to-peak.

For accurate synchronization it is best to GATE, or punch in, the start of the tone on tape. Record the tone by itself (or while monitoring the CMI) rather than while taping the music. For equal tempo between external and internal sync:

$$\text{SPEED} = \frac{2010.5}{\text{ext sync in KHz}} \quad \text{EXT SYNC in KHz} = \frac{2010.5}{\text{SPEED}}$$

eg. An EXTERNAL sync tone of 1 000 Hz is equivalent to an INTERNAL SPEED of 2010.

NOTE: The sync tone is applied to the SYNC socket (Pin 2).

```
*****
**      15. CLICK control  **
**      *****
```

TO TURN CLICK ON/OFF use <arrow> keys to TAB to CLICK.

TYPE:	ON<set>	-	Turn click output on
	OFF<set>	-	Turn click output off

The CLICK (metronome) output must be connected at the back panel as described in the USERS MANUAL.

TO SET CLICK RATE use <arrow> keys to TAB to RATE.

TYPE:	nnn<set>
where: nnn = desired click rate	

The CLICK RATE defines the number of MICROBEATS in one BEAT of the click tempo for both internal and external SYNC. The following calibration table can be used when using the click with INTERNAL sync for cinema or television applications.

NOTE: The CLICK is found on three outputs :

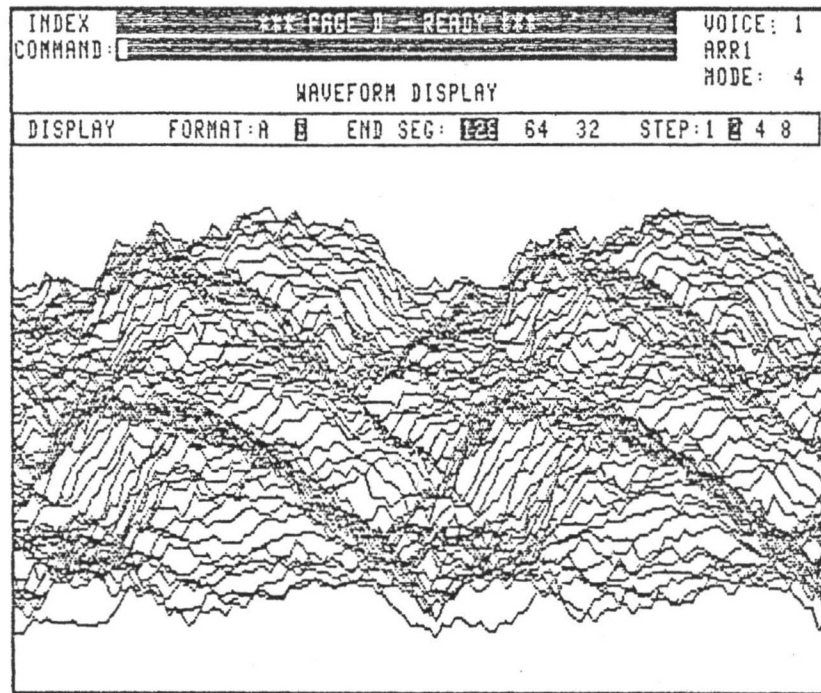
- 1: Phones output
- 2: Monitor Speaker output
- 3: Sync socket (Pin 3)

The CLICK volume is variable from the SYNC VOL MON control on the rear of the C.M.I.

FOR	SET	24 fps	25 fps
<u>microbeat calibration:</u>	<u>SPEED</u>	<u>5236</u>	<u>5026</u>
1 beat = 1 sec ( 60 mm):	CLICK RATE	192	200
1 beat = .5 sec (120 mm):	.	96	100
1 beat = S seconds:	.	S x 192	S x 200
Tempo = F frames per beat:	.	F x 8	F x 8
Tempo = T beats per min:	.	$\frac{T}{60} \times 192$	$\frac{T}{60} \times 200$



Section C: DISPLAY PAGE D) VOICE WAVEFORM DISPLAY



1. VOICE WAVEFORM display
2. FORMATTING selectors
3. DISPLAY waveform
4. SELECT any loaded VOICE
5. LOAD/SAVE Instrument or Voice files

P A G E D   V o i c e W a v e f o r m D i s p l a y

```
*****  
**  
** 1. VOICE WAVEFORM display **  
**  
*****
```

VOICE WAVEFORM DISPLAY allows the entire WAVEFORM MEMORY for a voice to be displayed on the screen at once. PAGE D is a purely visual page. The format of the display has been designed to reveal as much as possible about the voice waveform in a single glance, particularly when creating a voice by SAMPLING an EXTERNAL SOURCE (see PAGE 8 HELP).

The waveform display will show immediately whether the SAMPLE RATE was appropriate for a pitched external source:

If SAMPLE RATE was appropriate (i.e., voice is in tune with the system) waveform crests and troughs will proceed in linear, orderly way along the display - varying little in their position within each successive segment.

If SAMPLE RATE was almost appropriate (i.e., voice is slightly flat or sharp; a 1-segment LOOP produces a sudden slight pitch shift) waveform crests and troughs will "drift" laterally through the display. If this drift is to the RIGHT then sample rate was too HIGH - if to the LEFT then sample rate was too LOW.

If SAMPLE RATE was totally wrong then the display will usually be a hopeless jumble. The relationship of one cycle of signal to each segment of waveform memory necessary for correct tuning is also the relationship required for a visually coherent display. Thus voices that look good will inevitably sound good too.

```
*****  
**  
** 2. FORMATTING selectors **  
**  
*****
```

FORMAT SELECTOR provides the choice of 2 display formats.

FORMAT (A) is "tilted" diagonally for a 3-dimensional effect.

FORMAT (B) is vertically aligned with the screen. The display resolution is greater and fine detail is more easily distinguished.

To select FORMAT touch <A> or <B> with LIGHTPEN. The format may also be specified as part of the typed DISPLAY command.

A FORMAT (A) display is provided automatically whenever PAGE D is selected. Any loaded VOICE may be selected for display.

END SEGMENT SELECTOR indicates the SEGMENT number of the last segment displayed. This can be 128, 64 or 32.

To select END SEGMENT touch desired number with LIGHTPEN. The END SEGMENT may also be specified as part of the typed DISPLAY command.

STEP SELECTOR determines the NUMBER of SEGMENTS skipped between display traces. Thus if STEP = 4 every fourth segment is displayed. The STEP can be 1, 2, 4, or 8 within limits which are automatically displayed depending on the FORMAT selected.

To select STEP touch desired number with LIGHTPEN. The STEP value may also be specified as part of the typed DISPLAY command.

Section C: DISPLAY PAGE D) VOICE WAVEFORM DISPLAY

```
*****
**
** 3. DISPLAY waveform **
**
*****
```

<u>TO DISPLAY WAVEFORM</u>	TYPE:	LIGHTPEN:
with current settings	- D<return>	<DISPLAY>
select Format A	- DA<return>	n/a
select Format B	- DB<return>	n/a
select (new) End Segment	- D,e<return>	n/a
select (new) End Seg and Step	- D,e,s<return>	n/a

where: e = end segment number: 32,64,128 only  
s = step value: 1,2,4,8 only

EXAMPLES:

DA,128<return>      Display Format A, end seg = 128  
DB,32,1<return>     Display Format B, end seg = 32, step = 1  
D,64<return>        Display, end seg = 64  
D,,2<return>        Display, step = 2

The voice WAVEFORM MEMORY is displayed with the selected format, end segment and step.

To INTERRUPT the DISPLAY for any reason, press <ctrl-esc>.  
Press & hold <ctrl> - press <esc>.

```
*****
**
** 4. SELECT any loaded VOICE **
**
*****
```

TO SELECT any loaded VOICE for display,

TYPE: V,filename<return> or: V,n<return>  
where: filename = the name of a loaded voice  
n = the number 1-8 of a loaded voice

EXAMPLES: V,TUBA<return> - select voice TUBA  
V,4<return> - select voice 4

The NAME, MODE & NUMBER of the current voice are shown in the upper-right corner of the page. The names and numbers of all loaded voices are shown on PAGE 3.

```
*****
**
** 5. LOAD/SAVE Instrument or Voice files **
**
*****
```

TO LOAD/SAVE VOICES or INSTRUMENTS TYPE:

To LOAD a VOICE	- L,r,filename<return>
To SAVE a VOICE	- S,filename<return>
To CREATE a VOICE	- C,r,filename<return>
To LOAD an INSTRUMENT	- L,filename.IN<return>
To SAVE an INSTRUMENT	- S,filename.IN<return>

where: r = register A - H  
filename = 1-8 character filename

See PAGE 3 HELP for more about loading/saving files.

INDEX	*** PAGE 1 - READY ***
COMMAND:	
DISK LIBRARY	
DISKS:	FILE:
1 ORGANS	
2 KEYBOARD	
3 PIANOS	
4 GUITARS	
5 BASS	
6 DRUMS	
7 PERCUSSN	
8 STRINGS1	
9 STRINGS2	
10 BRASS	
11 REEDS	
12 WIND	
13 HUMANS	
14 BELLS	
15 ANALOG	
16 EFFECTS1	
17 EFFECTS2	
18 EFFECTS3	
19 EFFECTS4	
20 MODE1	

1. DISK LIBRARY
2. BUILD the library
3. READ a disk into library
4. FIND files in library
5. EXAMPLES of FIND command

P A G E L     D i s k   L i b r a r y

```

*****
**                               **
**      1.  DISK LIBRARY        **
**                               **
*****

```

THE DISK LIBRARY allows all filenames on all your disks to be kept for quick reference on your CMI SYSTEM DISK. The FIND command enables you to easily identify the disk on which any single file is found. Up to eighty disks can be maintained in the disk library. Each disk is given a NUMBER when the the library is originally created with the BUILD command. These numbers serve to identify the disks to the library (even if the DISKNAMES are changed) whenever the READ command is used to update the library for a single disk.

The FIND command allows individual files to be found as well as providing a PARTIAL MATCH facility by which various sorts of searches can be made through the library. For example you could display all VOICE files beginning with the letters "VIO", or display all files of any type which have the name "FRED".

To simply DISPLAY ALL FILES on a DISK, touch the DISKNAME with the LIGHTPEN. To return to the DISKNAME display, touch the TITLE of the PAGE: <DISK LIBRARY>.

```

*****
**                               **
**      2.  BUILD the library   **
**                               **
*****

```

TO BUILD A NEW LIBRARY first sort all your disks into some order meaningful to you. DISK NUMBERS will be assigned sequentially as each disk is READ into the LIBRARY. Place the first disk in the RH drive.

To begin the BUILD, TYPE: B<return>

This question will appear:

READ DISK IN RH DRIVE - ASSIGN NO. 1 (Y)?

TO REPLY:

TYPE:

Yes, proceed with BUILD. Y<return>

No, stop the BUILD.

N<return> or <return> or <ctrl-esc> When

the disk has been READ the same question will appear again; this time requesting approval to READ disk and assign the number 2. Place the next disk in the RH drive and REPLY as before. Continue this until ALL disks have been READ. At that time reply NO to the question (as shown above). The LIBRARY is now ready for use. See FIND command.

```
*****
**      3. READ a disk into library      **
**      *****                          **
*****
```

TO READ A DISK INTO LIBRARY

TYPE:

Read disk

- R&lt;return&gt;

Read disk, assign new number (n) - R;n&lt;return&gt;

where: n = new disk number, not larger than the number of  
disks now in the library plus 1.

This question will appear:

READ DISK IN RH DRIVE - (Y)?

TO REPLY:

TYPE:

Yes, proceed with BUILD. Y&lt;return&gt;

No, stop the BUILD. N&lt;return&gt; or &lt;return&gt; or &lt;ctrl-esc&gt;

To keep your LIBRARY up to date, the READ command must be used whenever  
the content of a disk changes significantly.

```
*****
**      4. FIND files in library      **
**      *****                          **
*****
```

FINDING FILES IN THE LIBRARY

The FIND command is used to located files in the library. It can be  
used in two ways:

1. SEARCH for a single, specific filename.

In this case, each disk in the library is searched for the file;  
the name of any disk on which it was found will be displayed.

2. SEARCH for an incomplete, or partial filename.

In this case the library is searched disk-by-disk. For each disk on  
which any files are found matching the partial name, the name of the disk  
and all matching files are displayed.

TO FIND A FILENAME TYPE: F,filename.sf<return>

where: filename.sf = a complete or partial filename

If the filename and suffix are specified then the name is COMPLETE. If  
the filename or suffix or BOTH are missing, the name is INCOMPLETE. The  
name is also incomplete if the special character "\*" is used. This  
character indicates a "don't care" condition and its use is best  
described through the examples on next sheet.

```
*****
**      5.  EXAMPLES of FIND command      **
**      *****                          **
*****
```

FIND COMMAND EXAMPLES:

```
F,TUBA2.VC<return> - Complete name: find all copies of
                    file TUBA.VC.
F,TUBA2<return>    - Incomplete name: find all files of
                    any suffix with the name TUBA2.
F,TUB*.CO<return> - Incomplete name ("*" used): find
                    all .CO files that begin with
                    letters "TUB" (don't care about
                    rest of name).
F,.IN<return>     - Incomplete name: find all .IN files
F<return>         - Incomplete name: find all files.
F,T*.*<return>   - Incomplete name: find all files
                    beginning with letter "T".
```

Whenever an incomplete name is specified, the system will print this message and wait whenever matches are found on a disk:

TYPE <RETURN> TO CONTINUE SEARCH

To proceed with the search press the <return> key. To halt the search at this point, press <ctrl-esc>;  
(press & hold <ctrl> - press <esc> ).



## - SECTION D -

INSTALLATION AND EXTERNAL CONNECTIONS

The following details must be followed carefully for correct operation and to prevent damage to the system (refer Figure F). All cables use different connectors to prevent accidental incorrect connection and so care must be taken not to force, for example, a seven-pin plug into a six-pin socket.

ALL CONNECTIONS SHOULD BE MADE WITH THE MAINS SWITCH TURNED OFF!

MAINS VOLTAGE AND FREQUENCY

It is very important that the mains selector switches on the back panel of the card cage and the video monitor are in the appropriate positions for the available mains voltage.

FAILURE TO ENSURE CORRECT SWITCH SETTINGS MAY RESULT IN  
INCORRECT OPERATION OR DAMAGE TO THE UNIT

Systems are shipped with the voltage and frequency set according to the requirements of the local supply. Should a system require changing from 110V to 240V or vice versa your distributor must be consulted as pulleys on the disk drives must be changed to accommodate the 50Hz/60Hz changeover. Operating the system with incorrect pulleys will cause disk drive malfunction.

The appropriate mains connection should be fitted to the mains cable (MC006) ensuring that the EARTH (GROUND) connection is utilized.

MONITOR CONNECTIONS

Plug the 3-pin insulated connectors of cable MC007 into the sockets marked "GRAPHICS POWER" on the back of the card cage and video monitor.

Plug the round 5-pin connectors of cable MC065 into the sockets marked "GRAPHICS" on the back of the card cage and video monitor.

MUSIC KEYBOARD

Plug the round 7-pin connectors of cable MC064 into the sockets marked "KEYBOARD POWER" on the back of the C.M.I. and master music keyboard.

Plug the flat 9-pin connector of cable MC003 from the alpha-numeric keyboard into the socket marked "ALPHA KEYBOARD" on the back of the master music keyboard.

If the music keyboard is not required, the alpha-numeric keyboard may be plugged directly into the socket marked "KEYBOARD" on the back of the C.M.I.

Connect the optional slave music keyboard to the master music keyboard with cable MC0059.

PEDAL INPUTS

The sockets marked "PEDAL 1", "PEDAL 2" and "PEDAL 3" are for optional special effects foot pedals. Either ON-OFF or continuously variable type pedals can be accommodated.

Connector type: Cannon 5-pin.

Section D:

INSTALLATION AND LAYOUT

Pin 1        Ground  
Pin 2        On-Off: <1V=Off, >4V=On.  
Pin 3        -20V Supply Out.  
Pin 4        +20V Supply Out.  
Pin 5        Analog Input: -5V TO +5V.

PRINTER

For use with optional printer. For use with Music Composition Language, optional word processing, graphics. Use cable MC062. Serial data from mainframe to printer, "busy" flag from printer to mainframe, plus "device on" signal used to switch on printer in readiness to receive data.

Connector type: Cannon 5 pin.

Pin 1        Signal Ground.  
Pin 2        Not Connected.  
Pin 3        FLAG0. "Busy" flag from printer. RS-232 levels. <-7 volts when printer ready, >+7 volts when printer busy.  
Pin 4        DONO. "Device On" control from mainframe to printer. RS-232 level, >+7 volts to enable printer, <-7 volts to disable printer. This signal is optional as some printers do not require it.  
Pin 5        DATA0. Serial data to printer. RS-232 levels, ASCII format. Normally at -10 volts. For each character sent from the mainframe to the printer a burst of +10 volt pulses lasting approx. 1 mS should be seen.

A U D I O   C O N N E C T I O N S

The various audio connections are made to the FAIRLIGHT as follows.

PHONES

Output for driving headphones. Monitors the MIXED LINE output. Volume is controlled by the "MON VOL" control at the back of the C.M.I. Internally, this output is taken from the MONITOR (speaker) output via a 100 ohm resistor.

Connector type: 1/4" (6.25 MM) stereo phono jack.

MONITOR

Output for driving a monitor speaker. The internal monitor amplifier will deliver a maximum of 20 watts R.M.S. into an 8 ohm speaker. Note that the C.M.I. is fitted with a 1 amp speaker fuse which will blow if the monitor amplifier is driven to full output under load for more than a second.

Connector Type: Cannon 3 pin.

Section D:

INSTALLATION AND LAYOUT

Pin 1 Ground  
Pin 2 Ground  
Pin 3 Active. With all channels producing a full-amplitude sinewave and the MONITOR control turned up to the point of clipping, this output should be approx. 38 volts P-P (with no load)

CHANNEL OUTPUTS 1-8

Individual channel outputs (balanced, 600 ohms impedance).

Connector type: Cannon 3 pin.

Pin 1 Ground  
Pin 2 Output Cold. Anti-phase output, maximum level 3.7 volts P-P.  
Pin 3 Output Hot. Maximum level 3.7 volts P-P.

MIXED LINE OUTPUT

Mixed output of all eight channels (balanced, 600 ohms impedance).

Connector Type: Cannon 3-Pin

Pin 1 Ground  
Pin 2 Output Cold. Anti-phase output, maximum level 3.7 volts P-P.  
Pin 3 Output Hot. Maximum level 3.7 volts P-P.

SYNC

Synchronizing input and output, for use with Music Composition Language (Page C) or Keyboard Sequencer (Page 9). This connector serves as both an input and output.

Connector type: Cannon 3-pin.

Pin 1 Ground  
Pin 2 Sync Input. Pulses or tone of 1 to 20 volts P-P. Waveform unimportant. Frequency range 2 Hz to 5 kHz. Impedance 10 K ohms.  
Pin 3 Click Output. Periodic pulse, rate controlled by Page 9 Sequencer or M.C.L. (Page C). Waveform is a spike of approx. 5 volts peak, approx. 5 mS wide, alternately positive and negative going.

FILTER OUTPUT

Output of the bandpass filter used by the Analogue to Digital converter. It is designed to enable the operator to monitor the effect of various bandpass filter settings.

Connector type: Cannon 3-pin.

Pin 1 Ground  
Pin 2 Ground  
Pin 3 Output. Amplitude for full-scale conversion is 10 volts P-P. Source impedance 600 ohms.

MIC IN

Balanced, 600 ohms input suitable for high output dynamic or condenser microphones. When the MIC/LINE switch is in the MIC position, this input is fed to the Analogue to Digital converter.

Connector Type: Cannon 3-pin

Pin 1	Ground
Pin 2	Input A
Pin 3	Input B

LINE IN

Balanced, 600 ohm line level input. This input is connected to the Analogue to Digital converter when the MIC/LINE switch is in the LINE position.

Connector Type: Cannon 3-pin

Pin 1	Ground
Pin 2	Input A. Amplitude of 1.4 volts P-P required for full scale conversion.
Pin 3	Input B. Amplitude of 1.4 volts P-P required for full scale conversion.

ADC DIRECT

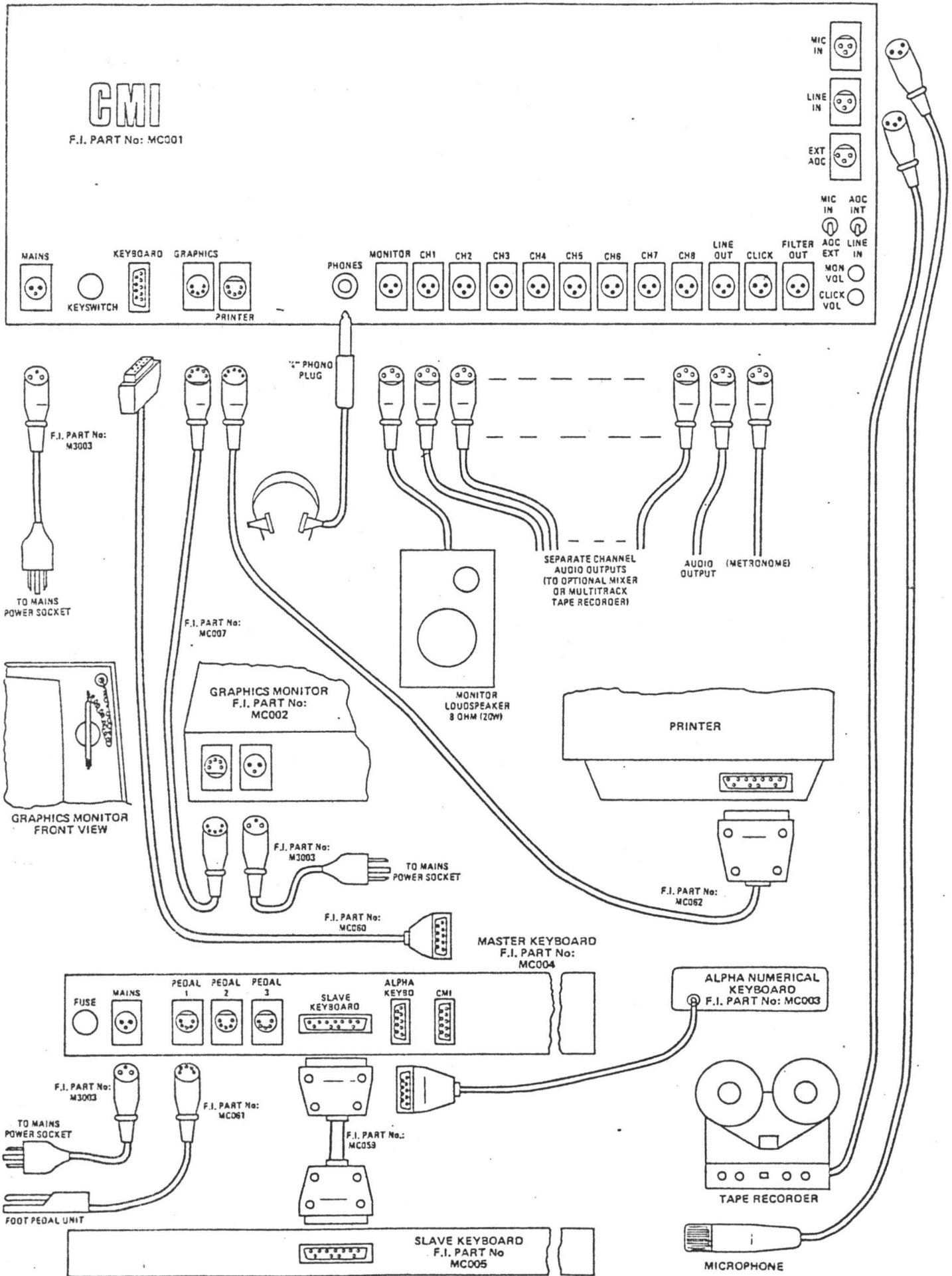
Direct input to the Analogue to Digital converter when the ADC DIRECT/ MIC LINE switch is in the ADC DIRECT position. Because this input is Direct Coupled, any D.C. offset on this input will result in a D.C. shift of a sound sample.

Connector Type: Cannon 3-pin.

Pin 1	Ground
Pin 2	Ground
Pin 3	Input. Amplitude for full scale conversion is 10 volts P-P.

# CMI

F.I. PART No: MC001



PAGE R - RHYTHM SEQUENCER

Page R will input music information from the music keyboard or the lightpen in real time. Patterns can be played any number of times in any order.

VARIABLES:

FILENAME: Set default filename for LOAD and NEW commands (see below).

PATTERN: Select current pattern. Disk-space permitting, there is a maximum of 255 patterns. Patterns are allocated sequentially (ie, you cannot select pattern 255 before selecting 1-254). This field is not active during PLAY.

TIME: Set time signature of current pattern (each pattern can have a different time signature). Not active during PLAY.

SPEED: Set sequencer speed - saved with file. NOTE: Please do NOT select a speed less than about 800!

FILE COMMANDS:

NB: Please do NOT use LOAD,SAVE or NEW commands unless sequencer is STOPPED.

LOAD - TYPE: L,filename<return> OR L<return>

Load an existing ".RS" file. Specification of a filename is optional. If none is specified, the filename currently displayed will be loaded; otherwise the specified file will be loaded and its name displayed.

NEW - TYPE: N,filename,nnn<return> OR N<return>

Create a new ".RS" file. Specification of filename is optional - exactly as for LOAD.

Size of the ".RS" file is specified by ",nnn"  
where nnn is between 1 and 255. Default is 1.

ADD - TYPE: A,nnn<return>

Add extra patterns to the current ".RS" file. Used if you run out of patterns.

NOTE: Because files are allocated from the largest contiguous amount of disk space, any new files created after an ".RS" file will effectively limit the number of patterns. If you try and add extra patterns, this will result in the message

NOT ENOUGH DISK SPACE

If you find yourself in this situation transfer the ".RS" file to another disk, delete it from the original disk, then re-transfer it back onto the original disk.

UNUSED - TYPE: U,nnn<return>

Retain nnn UNUSED patterns. This will trim the file to a certain length, that length being the total of USED patterns and UNUSED patterns.

Example: U,4 will leave the file with four UNUSED patterns in addition to the USED patterns.

SAVE - TYPE: (at least 2 letters of) SAVE<return>

Save the current file.

NOTE: file is SAVED automatically when changing to a new page, and individual patterns are automatically saved whenever modified. The current SPEED is saved with the file. The only way any modification can be not saved (lost) is if you remove the disk, re-boot or power-down from PAGE R without explicitly saving the file first.

#### PATTERN COMMANDS:

ZERO - TYPE: Z<return> LIGHTPEN: <ZERO>

Zero-out (erase) the CURRENTLY OPEN KEYBOARD CHANNEL for the CURRENT PATTERN. May be used while during PLAY.

DELETE - TYPE: D<return> LIGHTPEN: <DELETE>

Delete the LAST NOTE INSERTED. To delete any note, INSERT it again (with lightpen or by playing) and then DELETE it. May be used during PLAY.

RESET - TYPE: R<return> LIGHTPEN: <RESET>

Reset (erase) the CURRENT PATTERN. May be used during PLAY.

COPY - TYPE: C,(pattern number)<return>

copy specified pattern to currently displayed pattern

#### PLAY/STOP COMMANDS:

A pattern is that which appears inside the "note box" and can be any number from 1-255.

A section is a collection of patterns and can be any letter from "A" - "Z".

PLAY - TYPE: P<return> LIGHTPEN: <PLAY>

P,n<return> - play pattern (n) times

P,X<return> - play section(X)

P,X,n<return> - play section(X),(n) times

where: n = 1-255 , 0 = infinity (till STOP)

X = "A" - "Z"

NOTE: Playing a section is currently the easiest way to "record" on several patterns. Set up a section (e.g., X) with the required patterns, then:

P,X,0<return>

STOP - TYPE: S<return> LIGHTPEN: <STOP>  
or <control-esc>



```

INDEX
COMMAND:
RHYTHM SEQUENCER 01.11
File: NEW .RS      Total patterns: 1
Speed: 10000      Sync: INT   Click: ON   Used: 1 Left: 0

STEP: 1
play: 1  ..  ..  ..  ..  ..  ..  ..
x's: 0   ..  ..  ..  ..  ..  ..  ..

SECTION: A
play: ..  ..  ..  ..  ..  ..  ..
x's: ..  ..  ..  ..  ..  ..  ..

PLAY      STOP      Edit:  PATTERN
    
```

This is the default SONG display on Page R for the file named NEW.RS. To see the SONG display either point the lightpen at SONG in the bottom left hand corner of the display or

type E<return> for "edit"

Continuously typing E<return> will alternate the display between "SONG" and "PATTERN".

The above illustration is the default setting of Page R upon starting a new .RS file. A new .RS file will have at least 1 pattern. If P<return> is typed or the lightpen pointed at PLAY then the .RS file will play pattern 1 endlessly (infinite) times. To stop the sequence

type S<return>  
 or <CTRL-ESC>  
 or point the lightpen at STOP

PATTERNS and SECTIONS

The general idea with Page R sequencing is to build up a song in PATTERNS and then join these patterns together into SECTIONS. One PATTERN is the area where musical notes are displayed. A PATTERN has a number between 1-255. A SECTION has a letter between A-Z.

Example

To work on Pattern\_2 continuously move the cursor to the field indicated

type 2<set>

Immediately underneath set the number of times to play to infinity. To get the infinity character

type 0<set>

Pattern 2 is now ready to be sequenced.

STEP:	1							
play:	A	B	C	B	Z	E	D	H
x's:	1	1	1	1	1	1	1	1
SECTION:	E							
play:	6	7	6	7	8	9	10	11
x's:	1	1	1	1	1	1	1	1

STEP:	1							
play:	A	B	C	E	Z	E	D	H
x's:	1	1	1	1	1	1	1	1
SECTION:	E							
play:	13	12	..	..	..	..	..	..
x's:	1	1	..	..	..	..	..	..

STEP:	1							
play:	A	B	C	B	Z	E	D	H
x's:	1	1	1	1	1	1	1	1
SECTION:	E							
play:	14	15	..	..	..	..	..	..
x's:	1	1	..	..	..	..	..	..

INDEX																																																	
COMMAND: RHYTHM SEQUENCER 01.11																																																	
File: TYMPROLS.RS	Total patterns: 4																																																
Speed: 10000 Sync: INT Click: ON	Used: 4 Left: 0																																																
<table border="1"> <tbody> <tr> <td>STEP: 1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>play: A</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> </tr> <tr> <td>x's: ∞</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> <td>..</td> </tr> <tr> <td>SECTION: A</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>play: B</td> <td>4</td> <td>2</td> <td>4</td> <td>3</td> <td>..</td> <td>..</td> <td>..</td> </tr> <tr> <td>x's: 2</td> <td>1</td> <td>2</td> <td>1</td> <td>1</td> <td>..</td> <td>..</td> <td>..</td> </tr> </tbody> </table>		STEP: 1								play: A	..	..	..	..	..	..	..	x's: ∞	..	..	..	..	..	..	..	SECTION: A								play: B	4	2	4	3	..	..	..	x's: 2	1	2	1	1	..	..	..
STEP: 1																																																	
play: A	..	..	..	..	..	..	..																																										
x's: ∞	..	..	..	..	..	..	..																																										
SECTION: A																																																	
play: B	4	2	4	3	..	..	..																																										
x's: 2	1	2	1	1	..	..	..																																										
PLAY STOP Edit: PATTERN																																																	

A group of eight or less patterns can be linked together as a SECTION. SECTIONS may be nested within other SECTIONS.

In the above example, TYMPROLS.RS, section A is played infinitely. Section A consists of

```
SECTION B played twice
PATTERN 4 played once
PATTERN 2 played twice
PATTERN 4 played once
PATTERN 3 played once
```

To see the structure of section B,

```
type B<set>
```

in the field beside SECTION as illustrated below.

STEP: 1							
play: A	..	..	..	..	..	..	..
x's: ∞	..	..	..	..	..	..	..
SECTION: B							
play: 1	2	..	..	..	..	..	..
x's: 2	2	..	..	..	..	..	..

So, in full, Section A consists of

```
SECTION B played twice {PATTERN 1 played twice
                        {PATTERN 2 played twice
```

```
PATTERN 4 played once
PATTERN 2 played twice
PATTERN 4 played once
PATTERN 3 played once
```

This sequence of patterns will be played endlessly.

Note that if the "infinity" character occurs anywhere in a sequence of patterns or sections then the sequence will never get past that point.

INDEX																																																							
COMMAND:	RHYTHM SEQUENCER 01.11																																																						
File: TOMBO	.RS				Total patterns: 40																																																		
Speed: 4000	Sync:INT	Click: ON			Used: 40	Left: 0																																																	
<table border="1"> <tr> <td>STEP: 1</td> <td colspan="7"></td> </tr> <tr> <td>play: A</td> <td>B</td> <td>C</td> <td>B</td> <td>Z</td> <td>E</td> <td>D</td> <td>H</td> </tr> <tr> <td>x's: 1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>SECTION: 1</td> <td colspan="7"></td> </tr> <tr> <td>play: 1</td> <td>1</td> <td>3</td> <td>2</td> <td>5</td> <td>5</td> <td>3</td> <td>4</td> </tr> <tr> <td>x's: 1</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </table>								STEP: 1								play: A	B	C	B	Z	E	D	H	x's: 1	1	1	1	1	1	1	1	SECTION: 1								play: 1	1	3	2	5	5	3	4	x's: 1	1	1	2	1	1	1	1
STEP: 1																																																							
play: A	B	C	B	Z	E	D	H																																																
x's: 1	1	1	1	1	1	1	1																																																
SECTION: 1																																																							
play: 1	1	3	2	5	5	3	4																																																
x's: 1	1	1	2	1	1	1	1																																																
<p style="text-align: center;">PLAY      STOP      Edit: PATTERN</p>																																																							

### STEP function

The STEP function does not affect the order or sequencing of patterns and sections in any way. Its function is to allow you to inspect, change or add to the sequence of patterns and sections when there are more than eight entries in the play line. By moving the cursor to the field adjacent to STEP

and typing 1<add>

you will observe the sequence of numbers (patterns) and letters (sections) move to the left, the left most entry disappearing off the screen and a new entry appearing on the right. In this way up to 248 entries may be inserted even though you can only see eight at a time.

STEP: 1							
play: B	C	B	Z	E	D	H	B
x's: 1	1	1	1	1	1	1	1
STEP: 2							
play: C	B	Z	E	D	H	B	Z
x's: 1	1	1	1	1	1	1	1

STEP: 3							
play: D	H	B	Z	B	D	H	..
x's: 1	1	1	1	1	1	1	..
STEP: 4							
play: H	B	Z	B	D	H	..	..
x's: 1	1	1	1	1	1	..	..

PAGE R - RHYTEM SEQUENCER  
-----

VARIABLES:  
-----

FILENAME: Set default filename for LOAD and NEW commands (see below).

PATTERN: Select current pattern. Disk-space permitting, there is a maximum of 255 patterns. A new file has 1 pattern. Patterns are allocated sequentially (ie, you cannot select pattern 255 before selecting 1-254). This field is not active during PLAY.

TIME: Set time signature of current pattern (each pattern can have a different time signature). Not active during PLAY.

SPEED: Set sequencer speed - saved with file. NOTE: There is currently no lower limit - please do NOT select a speed less than about 800!

FILE COMMANDS:  
-----

nb: Please do NOT use LOAD,SAVE or NEW commands unless sequencer is STOPPED (a temporary oversight).

LOAD - TYPE: L,filename<return> OR L<return>

Load an existing ".RS" file. Specification of a filename is optional. If none is specified, the filename currently displayed will be loaded; otherwise the specified file will be loaded and its name displayed.

NEW - TYPE: N,filename<return> OR N<return>

Create a new ".RS" file. Specification of filename is optional - exactly as for LOAD.

SAVE - TYPE: (at least 2 letters of) SAVE<return>

Save the current file. NOTE: file is SAVED automatically when changing to a new page, and individual patterns are automatically saved whenever modified. The current SPEED is saved with the file. The only way any modification can be not saved (lost) is if you re-boot or power-down from PAGE R without explicitly saving the file first.

PATTERN COMMANDS:  
-----

ZERO - TYPE: Z<return> LIGHTPEN: <ZERO>

Zero-out (erase) the CURRENTLY OPEN KEYBOARD CHANNEL for

the CURRENT PATTERN. May be used while during PLAY.

DELETE - TYPE: D<return> LIGHTPEN: <DELETE>

Delete the LAST NOTE INSERTED. To delete any note, INSERT it again (with lightpen or by playing) and then DELETE it. May be used during PLAY.

RESET - TYPE: R<return> LIGHTPEN: <RESET>

Reset (erase) the CURRENT PATTERN. May be used during PLAY.

PLAY/STOP COMMANDS:

PLAY - TYPE: P<return> LIGHTPEN: <PLAY>  
P,n<return> - play piece (n) times  
P,X<return> - play section(X)  
P,X,n<return> - play section(X),(n) times

where: n = 1-255, 0 = infinity (till STOP)  
X = "A" - "Z"

NOTE: Playing a section is currently the easiest way to "record" on several patterns. Set up a section (e.g., X) with the required patterns, then:  
P,X,0<return>

STOP - TYPE: S<return> LIGHTPEN: <STOP>

\* 4/8/82 - mc



PRELIMINARY

INDEX COMMAND: **STOP**  
 File: FRED  
 Speed: 251%  
 Pattern: 1  
 Time: 4/4  
 Transpose: 0  
 Total Patterns: 32  
 Used: 14  
 Left: 18

BOREMI  
 SHARES  
 CABASA  
 BASS1  
 MARBLCK  
 FLUTE  
 ARP1  
 BRASS1  
 VOICES

Audible: ON  
 PLAY: ON  
 INDEX: ON  
 HOLD: ON  
 FRED: ON  
 SPEED: ON  
 TIME: ON  
 TRANSPOSE: ON

INSERT  
 LOCK  
 DELETE  
 CANCEL  
 RECORD  
 PATTERN SEQUENCER READY  
 editor: BOREMI

ZERO  
 FILL  
 PATTERN  
 SONG

PATTERN SEQUENCER READY  
 editor: BOREMI  
 Total Patterns: 32  
 Used: 14  
 Left: 18

BOREMI  
 SHARES  
 CABASA  
 BASS1  
 MARBLCK  
 FLUTE  
 ARP1  
 BRASS1  
 VOICES

PATTERN SEQUENCER READY  
 editor: BOREMI  
 Total Patterns: 32  
 Used: 14  
 Left: 18





PRELIMINARY

This short introductory example shows how to get Page R going immediately. Detailed explanations of commands are provided after the example.

Go to Page 3 and set up the following configuration.

INDEX							
COMMAND:							
REGISTER CONTROL							
REGISTER	NPHONY	VOICE	MODE	OCT	SEMI	FINE	CHANNELS
A	1	1)	4	0	0	0	1.....
B	1	2)	4	0	0	0	.2.....
C	1	3)	4	0	0	0	..3.....
D	1	4)	4	0	0	0	...4....
E	1	5)	4	0	0	0	....5...
F	1	6)	4	0	0	0	.....6..
G	1	7)	4	0	0	0	.....7.
H	1	8)	4	0	0	0	.....8

KEYBOARD CONTROL							
KBD	SELECTION				MASTER TUNING		
1	A	A	A	A	A	A	1 : MASTER PITCH: 128
2	B	B	B	B	B	B	2 : SLAVE SCALE: $12\sqrt{2.00}$
3	C	C	C	C	C	C	
4	D	D	D	D	D	D	
5	E	E	E	E	E	E	
6	F	F	F	F	F	F	
7	G	G	G	G	G	G	
8	H	H	H	H	H	H	

This set-up is the best way to allocate voices for Page R sequencing. Each voice has its own independant keyboard. It may be handy at this stage, to save this keyboard/channel setup as an INSTRUMENT file (.IN), say PAGERBED.IN so that for later, Page 3 can be set-up like the above merely by loading PAGERBED.IN. Now go to Page 2 and load a voice into each Register from A to F, a total of eight voices. Having done that, go to Page R.

NEW SEQUENCE

A new sequence called FRED.RS will be created. Every Page R sequence is built up from "patterns". The patterns are then linked together into "sections" to form a complete song.

Type . . . . . NEW FRED 4<return>

The "4" signifies that FRED.RS will be 4 "patterns" long. A "pattern" is everything that appears inside the note box on the right-hand side of the screen. You see one pattern at a time. When a new sequence is created like this the CMI is immediately ready to play pattern 1 continuously. As well the CLICK output is ON. Monitor the CLICK whilst recording to keep time with the CMI. The CLICK comes out

- 1) the SYNC socket (Pin 3)
- 2) the PHONES output
- 3) the MONITOR SPEAKER output

The CLICK volume is variable from the SYNC VOL MON control on the rear of the CMI.



RECORDING

Type . . . . . REC<return>

or point the light-pen at the RECORD area near the bottom of the screen. The CMI now goes into the RECORD mode, continuously playing pattern 1 with a CLICK output, and recording any activity on the keyboards if they are enabled. To enable a keyboard just press the DOWN ARROW key a number of times until the CURSOR reaches the desired keyboard number and lights up a thick horizontal band where notes subsequently appear. Any monophonic playing that you now do will appear on the screen as notes within this band of light.

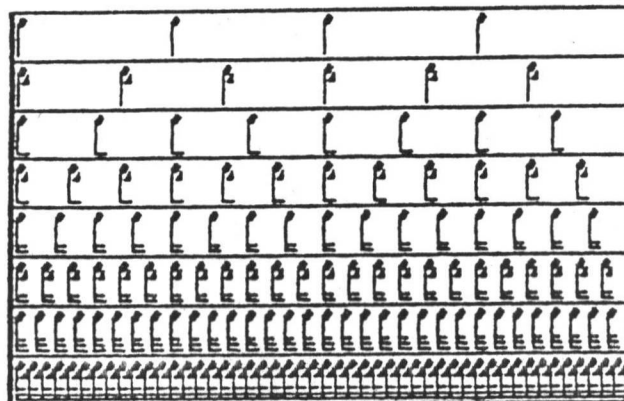
Building up a pattern on Page R is done keyboard by keyboard.

The CMI will put a time resolution on your playing to put it on the beat. The time resolution is changed by either typing + or - or pointing the light-pen at the group of notes near the bottom right-hand corner of the screen.

Shown below on each Keyboard are the time resolutions possible.

By pointing to

maximum number of notes  
per keyboard



The maximum is 48 notes per keyboard per pattern. This permits a certain amount of ease for the user in entering notes with correct timing.

To wipe out mistakes on a keyboard line just

type . . . . . Z<return>

or point light-pen at ZERO.



CHANGING PATTERNS

We now want to work on pattern 2, that is play pattern 2 continuously while selectively recording. At the moment the CMI plays pattern 1 continuously. Point the light-pen at the word "SONG" in the bottom-most right-hand corner of the screen,

PRELIMINARY

or type . . . . . E<return>

The display will change from:

the PATTERN EDITOR

to the SONG EDITOR

STEP	play	count					
1	-	-	-	-	-	-	-
SECTION A							
play	-	-	-	-	-	-	-
count	-	-	-	-	-	-	-

STEP:	1						
play:	1	:	:	:	:	:	:
count:	∞	:	:	:	:	:	:
SECTION: A							
play:	:	:	:	:	:	:	:
count:	:	:	:	:	:	:	:

The above is the default SONG setting that the CMI uses when a new sequence is begun.

The reason why the CMI is playing pattern 1 continuously is revealed in the

play: 1  
count: ∞

part of the display. It means the first thing the CMI will play will be pattern 1. The ∞ symbol signifies infinity so the CMI never stops playing pattern 1.





Therefore to play pattern 2 just move the CURSOR down to where the "1" is situated by using the down-arrow key,

and type . . . . . 2<set>

The display should now look like:

STEP:	1						
play:	2	:	:	:	:	:	:
count:	∞	:	:	:	:	:	:
SECTION:	A						
play:	:	:	:	:	:	:	:
count:	:	:	:	:	:	:	:

The infinity character is obtained by typing zero.

By pointing the light-pen at the word "PATTERN" in the bottom right-hand corner of the screen,

or typing . . . . . E<return>

the display reverts back to the pattern format and is now ready for pattern 2.

LINKING PATTERNS

To link four patterns together so that they play one after the other, set up the SONG EDITOR to look like:

STEP:	1						
play:	A	:	:	:	:	:	:
count:	∞	:	:	:	:	:	:
SECTION:	A						
play:	1	2	3	4	:	:	:
count:	1	1	1	1	:	:	:

This has the following effect:

SECTION A is played continuously (infinitely).

SECTION A consists of: pattern 1 played once  
pattern 2 played once  
pattern 3 played once  
pattern 4 played once.

Therefore patterns 1 to 4 are played one after the other continuously.



There are many ways to link and nest patterns and sections. The following is entirely valid.

PRELIMINARY

STEP:	1							
play:	2	B	C	A	:	:	:	:
count:	3	1	4	$\infty$	:	:	:	:
SECTION:	A							
play:	1	2	B	4	D	24	8	:
count:	1	1	3	98	2	1	1	:

There are no restrictions on which pattern is played by which section etc. Section A for example may consist of Sections B and C which may consist of more sections. However once the infinity character is encountered the CMI will loop around that section or pattern continuously.



P A G E R R H Y T H M S E Q U E N C E R

Page R can be thought of as eight monophonic sequencers playing at once.

The sequencers play in PATTERNS which can then be grouped into SECTIONS in any order with any number of repeats.

SECTIONS can be grouped within other SECTIONS.

PATTERNS can be played in live from the music keyboard, in which case the CMI adjusts the note timing to the nearest subdivision. Notes can be inserted or deleted with the lightpen also and precise adjustments can be made to pitch, volume and note duration.

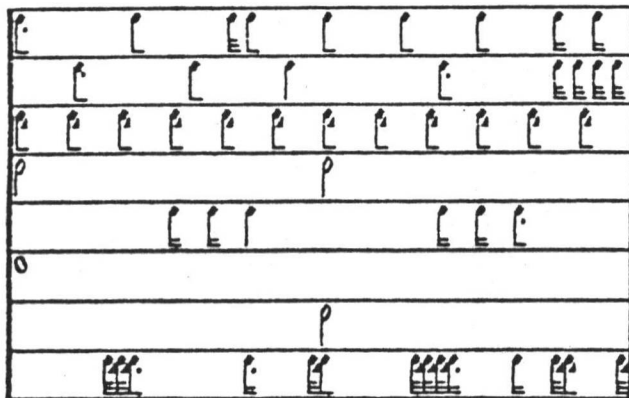
PAGE R COMMANDS

To create a new sequence file (.RS) type

NEW <filename> <number of patterns, 1-255><return>

<filename> is the identifying name.

One pattern is everything inside the "note-box" on Page R. This is the note-box:



EXAMPLES

NEW FRED 10<return>

A new file is started called FRED.RS and it is 10 patterns in size.

NEW FRED<return>

A new file is started called FRED.RS and it has the maximum number of patterns allocated that is possible. On a blank disk this number is 255.

NEW FRED,255<return>

A new file called FRED.RS. It will be 255 patterns in length if there is enough disk space. If there is not enough disk space the CMI will work out how many patterns are possible and ask you if that number is alright.



PRELIMINARY

A typical dialogue might be:

<u>YOU</u>	<u>CMI response</u>	<u>COMMENTS</u>
PR<return>	FILENAME REQUIRED	Go to Page R and start a new file
NEW FRED,200	SPACE FOR ONLY 133 PATTERNS OK? <Y>	Type Y<return> if alright
Y<return>	Total Patterns: 133 Used: 1 Left: 132	This appears in the top left-hand corner, reflecting the size of the file

To ADD extra patterns, type

A <number of extra patterns><return>

To trim back the number of unused patterns, type

U <number of unused patterns><return>

The U command is the opposite of the A command.

The effects of the NEW, A and U commands can be seen in the top left-hand corner,

Total Patterns:	
Used:	Left:

Page R files (.RS) can be LOADED from Page R just like voice files.

To LOAD a previously created .RS file whilst on Page R type,

L <filename><return>

EXAMPLE

L FRED<return>

FRED.RS must exist on disk. If FRED does not exist on disk then the error message

FRED.RS NOT FOUND will result.

SAVING is automatic whenever a disk read or write occurs. This is signified by the red light on the right disk drive coming in. The only way to not save an .RS file would be to turn the power off, RESET the CMI or remove the sound disk from the disk drive before it made a disk access.







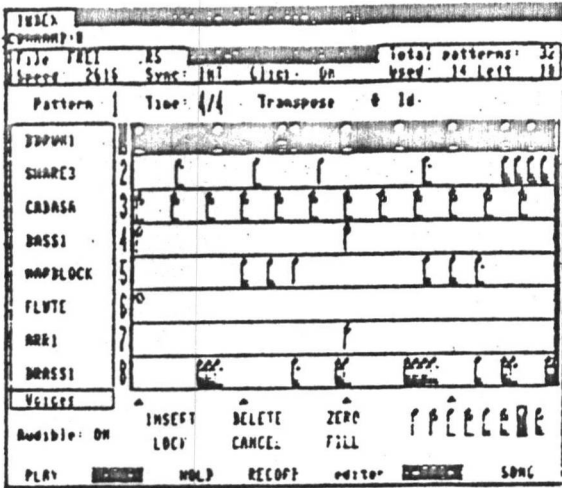


PAGE R - PATTERN COMMANDS (continued)

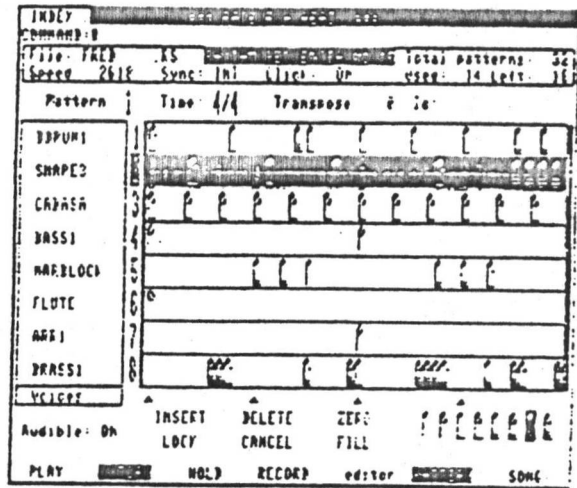
The names of the loaded voices appear on the left-hand side of the screen in descending order corresponding to Keyboard number.

To OPEN a Keyboard (and hear a voice) press the down arrow repeatedly until the CURSOR (band of light) reaches Voice 1. The band of light in the "note box" can contain from 0 to 48 notes depending on the TIMING RESOLUTION selected.

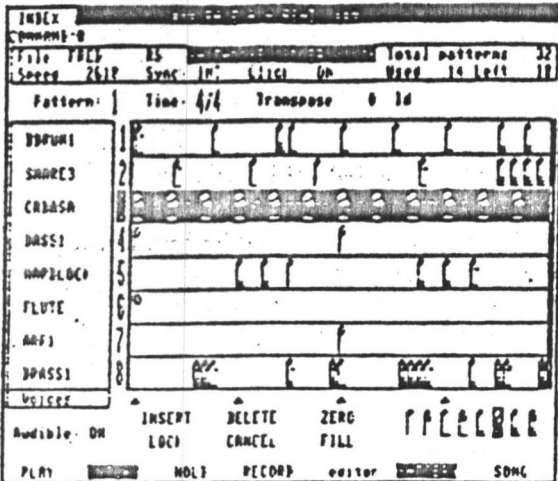
Keyboard 1 open



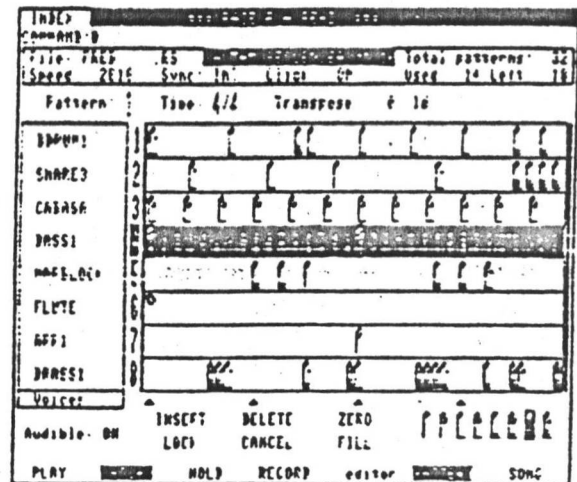
Keyboard 2 open



Keyboard 3 open



Keyboard 4 open





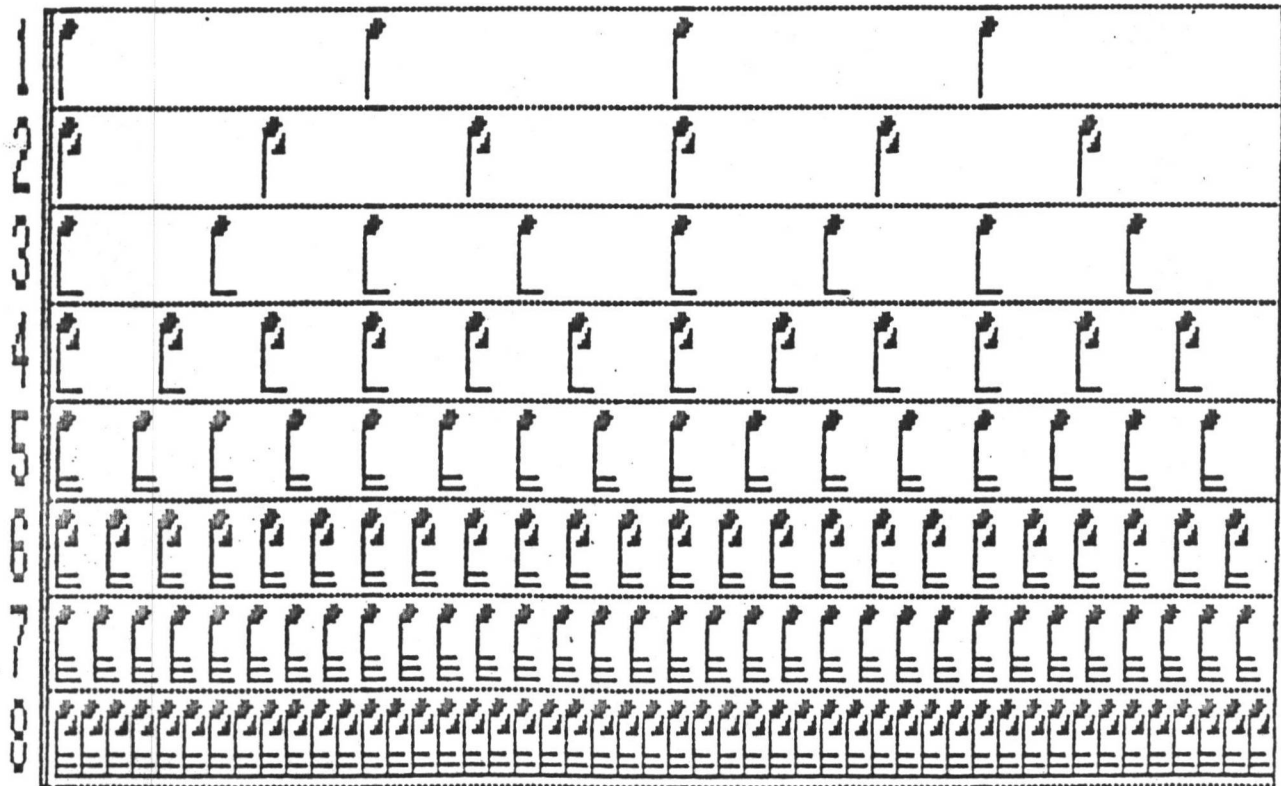
TIMING RESOLUTION

TIMING RESOLUTION may be changed by pointing the light-pen at the collection of notes in the bottom right-hand corner of the screen.



On the typewriter repeatedly press + or - to change resolution. This arrangement will put notes on the closest subdivision even if they are played in out of time.

Shown below is the effect of time resolution selection ranging minimum resolution (4 notes) on Keyboard 1 to maximum resolution (48 notes) on Keyboard 8.





Dynamics for each note are "behind" the Voice names. Move the CURSOR to any Keyboard.

Shown below is the CURSOR on Keyboard 1.

DRAFT

INDEX		PAGE R - PATTERN COMMANDS	
COMMAND: 1			
File: FRED	.RS	SEQUENCE 01	Total patterns: 32
Speed: 2618	Sync: INT	Click: ON	Used: 14 Left: 18
Pattern: 1	Time: 4/4	Transpose: 0	Id:
BDRUM1	1	[Pattern]	
SHARE3	2	[Pattern]	
CABASA	3	[Pattern]	
BASS1	4	[Pattern]	
MARBLOCK	5	[Pattern]	
FLUTE	6	[Pattern]	
ARR1	7	[Pattern]	
BRASS1	8	[Pattern]	
Voices			
Audible: ON	INSERT	DELETE	ZERO
	LOCK	CANCEL	FILL
PLAY	HOLD	RECORD	editor: [Pattern]
			SONG

Now press the left-arrow key. The display changes showing Key (pitch), Vel (velocity) and Dur (duration) as below.

INDEX		PAGE R - PATTERN COMMANDS	
COMMAND: 1			
File: FRED	.RS	SEQUENCE 01	Total patterns: 32
Speed: 2618	Sync: INT	Click: ON	Used: 14 Left: 18
Pattern: 1	Time: 4/4	Transpose: 0	Id:
F#4 6	1	[Pattern]	
B#3 1 7	2	[Pattern]	
F#4 2 3	3	[Pattern]	
E#5 6 24	4	[Pattern]	
F#4 4 2	5	[Pattern]	
A#4 6 48	6	[Pattern]	
E#4 5 12	7	[Pattern]	
D#3 8 1	8	[Pattern]	
Key Vel Dur			
Audible: ON	INSERT	DELETE	ZERO
	LOCK	CANCEL	FILL
PLAY	HOLD	RECORD	editor: [Pattern]
			SONG

Changes can be made to Key, Vel and Dur and INSERTED in the pattern. See INSERT command.





Audible: ON

INSERT  
LOCK

DELETE  
CANCEL

ZERO

PLAY

STOP

HOLD

RECORD

PRELIMINARY

**PLAY** The CMI can play any Section or the whole piece any number of times. For pattern grouping and section description see SONG COMMANDS.

The CMI will respond to PLAY command by showing you exactly which SECTION is playing and how many times.

Type P B<return>	Play Section B once.
P B 255<return>	Play Section B 255 times.
P B 0<return>	Play Section B infinite times. 0 is equivalent to infinity.
P * 0<return>	Play the whole song endlessly. * is equivalent to everything.

The CMI remembers the last PLAY command so subsequent replays only need P<return> to replay.

When in the PLAY mode, notes from the music keyboard will sound but will not appear on the screen, until RECORD is enabled.

**HOLD** When a SECTION (a series of patterns) is being played, you can HOLD the next pattern coming up indefinitely until you either hit PLAY or RECORD or type P<return> or REC<return>.

HOLD is the same as RECORD except that one pattern is continually repeated.

**RECORD** Same as PLAY except notes appear on the screen if CURSOR is moved to relevant Keyboard or Voice. Type REC<return>.



Audible: ON      INSERT      DELETE      ZERO  
                  LOCK      CANCEL      FILL  
PLAY      **STOP**      HOLD      RECORD

PRELIMINARY

**INSERT** Used to insert one note at a time. Move the light-pen along the note area of the relevant Keyboard. A gap in the illuminated band of light shows where the note will be inserted. The Key (pitch), Vel (Velocity) and Dur (Duration) information to the left will be inserted in the gap. The music Keyboard will enter Key (name of note), Vel (Velocity range 1-8). The music keyboard will only enter Duration when in the RECORD mode. Pitch defaults black notes to flats. To set black note default to sharp

type                    <control S><return>.

INSERT is the best way to correct isolated mistakes and to give each note individual expression. Type I<return>.

**LOCK-INSERT** Insert is locked ON. Insert notes wherever the CURSOR is pointed on the note area. Good for quickly inserting percussion-type notes where Key (pitch) stays constant. Remember if LOCK-INSERT is enabled, everything you point to in the note box will insert a note at that point. Type I,L<return>.

**DELETE** Delete one note at a time. A good way to carefully delete one note from a cluster. Type D<return>

**LOCK-DELETE** Delete is locked ON and notes are deleted wherever the light-pen is pointed. Many notes can be selectively deleted quickly. Type D,L<return>.

**LOCK** Locks INSERT or DELETE on until CANCELLED.

**CANCEL** Cancel LOCK. Opposite of LOCK. Release INSERT or DELETE from being ON. Type C<return>

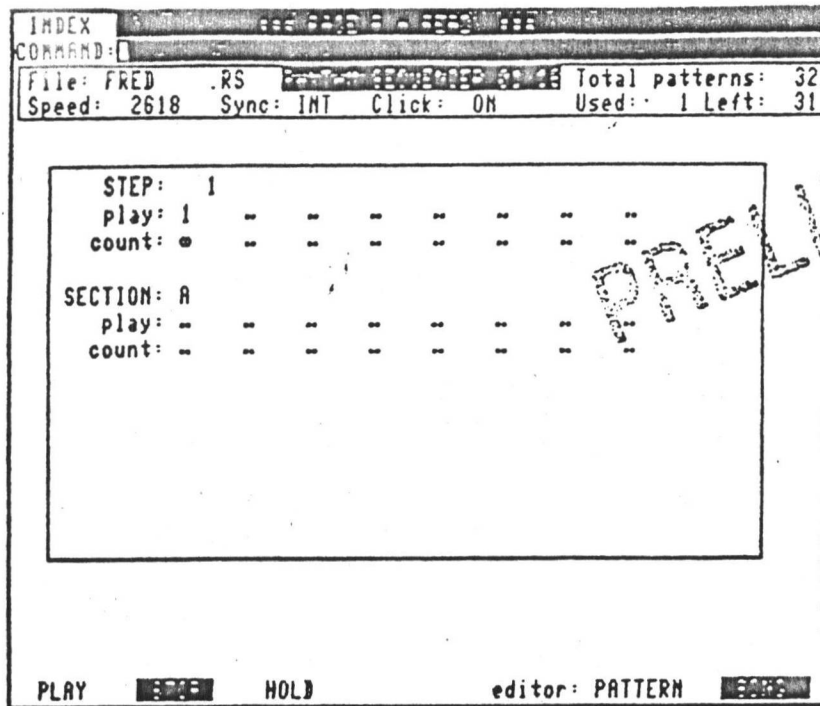
**ZERO** Zero all notes on one line of a pattern. Type Z<return>.

**FILL** Fill all notes on one line of a pattern. Number of notes depends on TIMING RESOLUTION. Note information comes from the values on the left-hand side of the Keyboard number. Press left-arrow key to see. Type F<return>.









PRELIMINARY

This is the default SONG display on Page R for the file named FRED.RS. To see the SONG display either point the lightpen at SONG in the bottom left hand corner of the display or

type . . . . . E<return>    for "edit"

Continuously typing E<return> will alternate the display between "SONG" and "PATTERN".

The above illustration is the default setting of Page R upon starting a new .RS file. A new .RS file will have at least 1 pattern. If P<return> is typed or the lightpen pointed at PLAY then the .RS file will play pattern 1 endlessly (infinite) times. To stop the sequence

type . . . . . S<return> or <CTRL-ESC>  
 or point the lightpen at STOP

PATTERNS and SECTIONS

The general idea with Page R sequencing is to build up a song in PATTERNS and then join these patterns together into SECTIONS. One PATTERN is the area where musical notes are displayed.

A PATTERN has a number between 1-255.  
 A SECTION has a letter between A-Z.

EXAMPLE

To work on Pattern 2 continuously move the cursor to the field indicated

type . . . . . 2<set>

Immediately underneath, set the number of times to play to infinity. To get the infinity character





```

INDEX
COMMAND:
File: FRED .RS Total patterns: 32
Speed: 2618 Sync: INT Click: ON Used: 4 Left: 28

```

STEP: 1							
play: A	∞						
count: ∞							
SECTION: A							
play: B	4	2	4	3			
count: 2	1	2	1	1			

PLAY [ ] HOLD editor: PATTERN [ ]

PRELIMINARY

A group of eight or less patterns can be linked together as a SECTION. SECTIONS may be nested within other SECTIONS.

In the above example, FRED.RS, section A is played infinitely. Section A consists of

- SECTION B played twice
- PATTERN 4 played once
- PATTERN 2 played twice
- PATTERN 4 played once
- PATTERN 3 played once

To see the structure of section B,

type . . . . . B<set>

in the field beside SECTION as below:

STEP: 1							
play: A	∞						
count: ∞							
SECTION: B							
play: 1	2						
count: 2	2						



So, in full, Section A consists of

SECTION B	played	twice	{	PATTERN 1 played twice
			}	PATTERN 2 played twice
PATTERN 4	played	once		
PATTERN 2	played	twice		
PATTERN 4	played	once		
PATTERN 3	played	once		

PRELIMINARY

This sequence of patterns will be played endlessly. Note that if the "infinity" character occurs anywhere in a sequence of patterns or sections then the sequence will never get past that point.

Here is another example of pattern and section sequencing.

Looking at Section B:

STEP:	1							
play:	A	B	C	B	Z	E	D	H
count:	1	1	1	1	1	1	1	1
SECTION:	B							
play:	6	7	..	..	..	..	..	..
count:	2	2	..	..	..	..	..	..

Looking at Section C:

STEP:	1							
play:	A	B	C	B	Z	E	D	H
count:	1	1	1	1	1	1	1	1
SECTION:	C							
play:	13	12	..	..	..	..	..	..
count:	1	1	..	..	..	..	..	..

Looking at Section Z:

STEP:	1							
play:	A	B	C	B	Z	E	D	H
count:	1	1	1	1	1	1	1	1
SECTION:	Z							
play:	14	15	..	..	..	..	..	..
count:	1	1	..	..	..	..	..	..



PRELIMINARY

STEP:	1							
play:	A	B	C	B	Z	E	D	H
count:	1	1	1	1	1	1	1	1
SECTION:	A							
play:	B	4	2	4	3	..	..	..
count:	2	1	2	1	1	..	..	..

STEP function

The STEP function does not affect the order or sequencing of patterns and sections in any way. Its function is to allow you to inspect, change or add to the sequence of patterns and sections when there are more than eight entries in the play line. By moving the cursor to the field adjacent to STEP

and typing . . . . . 1<add>

you will observe the sequence of numbers (patterns) and letters (sections) move to the left, the left most entry disappearing off the screen and a new entry appearing on the right. In this way up to 248 entries may be inserted even though you can only see eight at a time.

Step 1:

STEP:	1							
play:	A	B	C	B	Z	E	D	H
count:	1	1	1	1	1	1	1	1

Step 2:

STEP:	2							
play:	B	C	B	Z	E	D	H	B
count:	1	1	1	1	1	1	1	1

Step 3:

STEP:	3							
play:	C	B	Z	E	D	H	B	Z
count:	1	1	1	1	1	1	1	1

: : : :  
 : : : :  
 : : : :  
 : : : :  
 : : : :

Step 7:

STEP:	7							
play:	D	H	B	Z	B	D	H	..
count:	1	1	1	1	1	1	1	..

Step 8:

STEP:	8							
play:	H	B	Z	B	D	H	..	..



PAGE 6 MODIFICATIONS

DECEMBER 1982

BLEND makes a looped sound smoother by taking the loop length, dividing it into two halves, and adding the first half to the second half. After BLENDING the loop length is one half the original.

The simplest and quickest way to use this feature would be to load a voice, set up the loop on Page 7 or Page 4 for the smoothest loop, then go to Page 6 and

type . . . . . B<return>

Command: B<voice>:<segments>

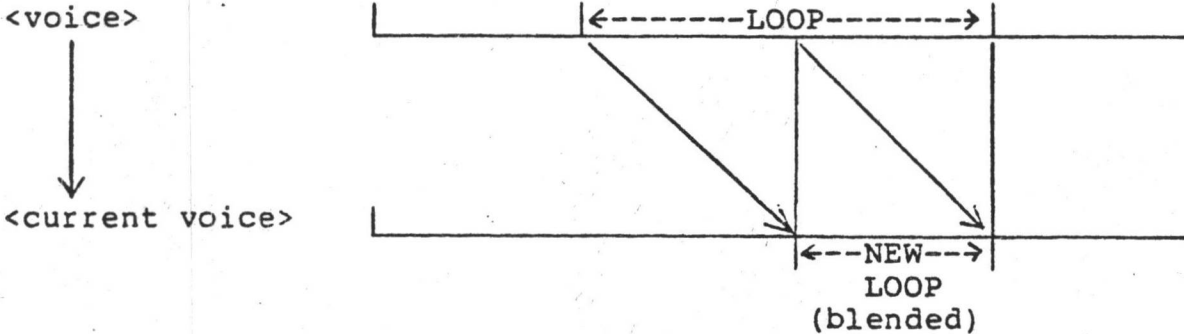
Transfers voice to current voice and blends in loop over the specified segments. Current voice is overwritten.

If no specified segments then defaults to current loop position in <voice>.

If no current loop in <voice> then default loop position is:

current segment on Page 6 to end of sound.

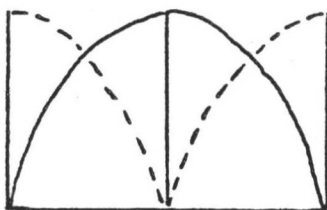
<voice> may be the SAME as current voice.



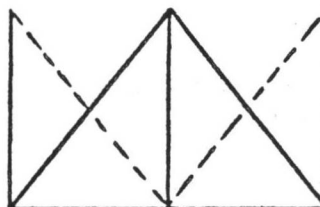
EXAMPLES

- B 2 voice 2 - current voice - default loop.
- B 2:\* voice 2 - current voice - loop over 128 segments.
- B:10 20 blend current voice and loop over segments 10 to 20.
- B blend the current voice with itself within the loop.  
The new loop is one half the original.

Also available is the ;L option, which causes the BLEND to use a linear ramping function instead of the default square root ramping function



without ;L



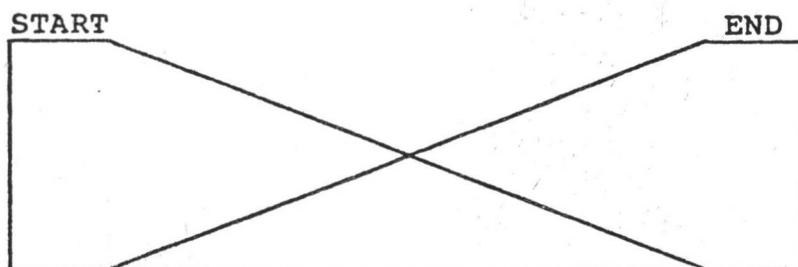
with ;L  
e.g., B 2:\*;L

The ;L option should be used for regular repetitive waveforms such as Page 5 generated sounds.

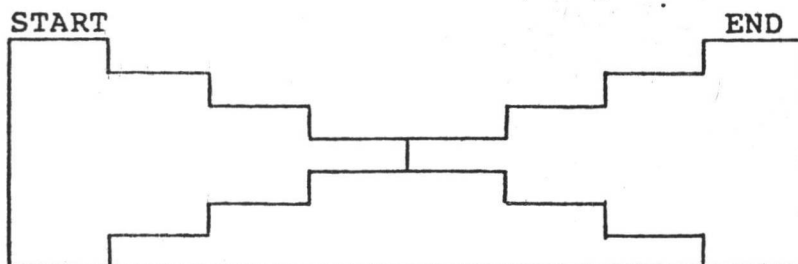
\*\*\*\*\*

MIX/MERGE commands now calculate the waveform in a byte-by-byte fashion instead of segment-by-segment as before. This is especially suitable for MIXING/MERGING over a small number of segments. The segment-by-segment method can still be obtained by using the ;S option.

e.g., MI,120,128;S



without ;S



with ;S



\*\*\*\*\*

NOISE

Command:           N,sss,eee

Fill segments sss to eee with white noise where:

    sss is the start segment  
    eee is the end segment

Default is current segment only.

EXAMPLE

    N           fill current segment with white noise.  
    N,\*         fill entire waveform with white noise.

INVERT

This command now FILLS automatically.

EXAMPLE

    I           INVERT and FILL current segment.  
    I,\*         INVERT and FILL whole waveform.

INVERT can now assist in making a REFLECTED waveform more continuous.

\*\*\*\*\*



## 1.0 GENERAL

### 1.1 FUNCTION

THE FUNCTION OF CMICON IS TO CREATE CMI FILES FROM USER GENERATED ASCII FILES. CMICON CAN BE USED TO PRODUCE MCL FILES, VOICE FILES, AND SEQUENCER FILES. CMICON DOES NOT GENERATE INSTRUMENT FILES OR CONTROL FILES.

### 1.2 INVOKING CMICON

CMICON IS INVOKED BY TYPING THE FOLLOWING COMMAND:

```
CON FILENAME1 .XX :Y ,FILENAME2 .ZZ :T
```

WHERE FILENAME1 AND FILENAME2 ARE THE NAMES OF THE INPUT AND OUTPUT FILES RESPECTIVELY, ONLY THE INPUT FILENAME (FILENAME1) IS REQUIRED. THE REMAINING FIELDS ARE OPTIONAL AND WILL DEFAULT IN THE SAME MANNER AS OTHER QDOS COMMANDS.

### 1.3 TYPE DIRECTIVE

THE TYPE DIRECTIVE IS USED TO SPECIFY WHICH TYPE OF CMI FILE THE FILE WILL BE USED TO GENERATE. THE TYPE DIRECTIVE HAS THE FOLLOWING FORMAT:

```
TYPE = XX
```

WHERE XX IS ONE OF THE FOLLOWING: PC, PT, SS; VC; SQ ALL INPUT FILES MUST HAVE A TYPE DIRECTIVE. THE TYPE DIRECTIVE MUST PRECEDE ANY ASCII DATA. HOWEVER, COMMENT LINES (PRECEDED WITH THE '\*' CHARACTER) MAY PRECEDE THE TYPE DIRECTIVE.

## 2.0 MCL FILES

A FILE WHICH IS TO BE CONVERTED TO MCL FORMAT MUST HAVE THE FOLLOWING CHARACTERISTICS:

- 1) TYPE DIRECTIVE (TYPE=PC, OR TYPE=PT, OR TYPE=SS)
- 2) RECORDS CONSISTING OF CORRECT MCL COMMANDS
- 3) MAXIMUM RECORD LENGTH OF 80 CHARACTERS

## 3.0 VOICE FILES

### 3.1 GENERAL FORMAT

A FILE WHICH IS TO BE CONVERTED TO A VOICE FILE MUST HAVE THE FOLLOWING PARTS:

- 1) TYPE DIRECTIVE (TYPE=VC)
- 2) MODE DIRECTIVE (MODE=1, OR MODE=4)
- 3) ASCII DATA

### 3.2 VOICE FILE DATA

#### 3.2.1 MODE 1 INPUT FILES

IF THE MODE DIRECTIVE SPECIFIES MODE 1, CMICON EXPECTS HARMONIC ARRAY DATA. THE HARMONIC DATA WILL CONSIST OF 32 RECORDS, ONE FOR EACH HARMONIC. EACH RECORD WILL CONTAIN 32

DECIMAL NUMBERS (1 - 128) WHICH COLLECTIVELY REPRESENTS THE AMPLITUDE ENVELOPE OF THE HARMONIC.

NOTE: A MODE 1 VOICE FILE PRODUCED BY CMICON MUST BE PROCESSED FURTHER BY THE COMPUTE COMMAND ON THE CMI PAGE 4 BEFORE THE VOICE IS PLAYABLE.

### 3.2.2 MODE 4 INPUT FILES

IF THE MODE DIRECTIVE SPECIFIES MODE 4, CMICON EXPECTS 16K BYTES OF WAVEFORM DATA. THIS ASCII DATA WILL BE CONVERTED TO BINARY AND WRITTEN INTO A VOICE FILE WHICH WILL REQUIRE NO FURTHER PROCESSING TO BE PLAYABLE.

### 3.3 SEQUENCER FILES

A FILE WHICH IS TO BE CONVERTED TO A SEQUENCER FILE MUST HAVE THE FOLLOWING PARTS:

- 1) TYPE DIRECTIVE (TYPE=SQ)
- 2) SPEED DIRECTIVE (OPTIONAL)
- 3) ASCII RECORDS

#### 3.3.1 SPEED DIRECTIVE

THE SPEED DIRECTIVE OPTION ALLOWS PRE-SETTING OF THE PAGE 9 SPEED CONTROL. THE SPEED DIRECTIVE IS OF THE FORM:

SPEED=NUMBER

NUMBERS OF 1000 - 65000 ARE VALID.

#### 3.3.2 SEQUENCER RECORDS

EACH ASCII SEQUENCER RECORD REPRESENTS ONE MUSICAL EVENT (KEY DEPRESSION OR KEY RELEASE). THE RECORDS ARE STRUCTURED AS FOLLOWS:

STREAM, NOTE NUMBER, TIME, DEPRESSION/RELEASE, KEY VELOCITY

A SEPARATE DESCRIPTION OF EACH ENTRY FOLLOWS:

STREAM - CAN BE THOUGHT OF AS KEYBOARD NUMBER. THE NUMBERS 1-8 ARE VALID.

NOTE NUMBER - NOTE NUMBERS 1 - 73 ARE VALID

TIME - TIME IS SPECIFIED IN MILLISECONDS. VALUES OF 1-16383 ARE VALID.

DEPRESSION/RELEASE - A 'D' INDICATES DEPRESSION AND AN 'R' INDICATES RELEASE.

KEYVEL - KEY VELOCITIES BETWEEN 1 AND 15 ARE VALID.

## 1.2 INTRODUCTION.

This document describes the use of Fairlight's Analog Interface Card (AIC). Included here are definitions of terms, installation instructions, a description of the AIC user interface software and AIC examples.

### 1.1 PURPOSE OF THE ANALOG INTERFACE CARD.

The AIC was designed to provide a control link between the Fairlight CMI and analog devices. This means the CMI can produce control voltages to drive analog synthesizers. In addition, the control voltages produced by analog synthesizers can be used to control the CMI.

### 1.2 DEFINITIONS:

The following terms take on a special meaning with reference to the AIC.

#### 1.2.1 INPUTS.

AIC 'inputs' are control voltages from an analog device used to control the CMI.

#### 1.2.2 OUTPUTS.

AIC 'outputs' are control voltages produced by the CMI to control an analog device.

#### 1.2.3 PATCH.

Looking at CMI Page A or figure 1 will make the idea of a patch clearer. Basically, a patch is a user command specifying how a particular analog input or output will be used. There are two types of patches; assignment and range. A description of each follows.

##### 1.2.3.1 ASSIGNMENT PATCH.

Assignment patches specify the function of a CMI output or of an analog device input. For example, an input could be used to simulate a CMI key depression or release. Another input could be used to specify the pitch of a CMI note. Assignment patches also contain information about which CMI channel, CNTRL, or SWTCH is affected. Assignment patches do not specify the voltage level of an input or output.

##### 1.2.3.2 RANGE PATCH.

Range patches allow the user to specify the voltage levels necessary for interfacing to a particular analog device. If, for example, an input from a 5 volt analog device was being used as a key depression/release, then the range patch would be '5'.

##### 1.2.3 AIC FILE.

Assignment and range patches can be saved on disk and re-loaded at a later time. Saving these patches produces an AIC file. The

INDEX  
COMMAND:

\*\* PAGE A - READY \*\*

AIC FILE: .AI

INPUT	ASSIGNMENT	RANGE	OUTPUT	ASSIGNMENT	RANGE
1	OFF	U	1	OFF	U
2	OFF	U	2	OFF	U
3	OFF	U	3	OFF	U
4	OFF	U	4	OFF	U
5	OFF	U	5	OFF	U
6	OFF	U	6	OFF	U
7	OFF	U	7	OFF	U
8	OFF	U	8	OFF	U
9	OFF	U	9	OFF	U
10	OFF	U	10	OFF	U
11	OFF	U	11	OFF	U
12	OFF	U	12	OFF	U
13	OFF	U	13	OFF	U
14	OFF	U	14	OFF	U
15	OFF	U	15	OFF	U
16	OFF	U	16	OFF	U

PITCH: TRIGR: KEYVL: CNTRL: SWTCH:  
1 2 3 4 5 6 7 8

FIGURE 1 PAGE A DEFAULT SETUP

suffix of an AIC file is 'AI'. A file containing patches to control a guitar synthesizer might be called 'GUITAR.AI'.

### 1.3 EXAMPLE.

Suppose you wish to use the CMI to drive an analog synthesizer. Say the synthesizer has a standard 1 volt/octave VCO and a 5 volt trigger requirement. This could be accomplished by connecting the trigger input of the synthesizer to AIC output channel 1 and the VCO to AIC output 2 (see section 2.0). Page A must then be patched as shown in figure 2. This would be done as follows:

- a) tab to output assignment 1
- b) light pen hit TRIGR then 1 on the page bottom  
(alternatively type T1 then the SET key)
- c) tab to output range 1
- d) type 5 then the SET key
- e) tab to output assignment 2
- f) light pen hit PITCH then 1 on the page bottom  
(alternatively type H1 then the SET key)
- g) tab to output range 2
- h) type 1 then the SET key

CMI channel 1 now controls the pitch and triggering of the analog synthesizer. If you wish to save this setup, type:

S,filename<RETURN>

The setup can be restored in the future by typing:

L,filename<RETURN>

For a more thorough description of Page A commands see appendix A.

## 2.0 INSTALLATION AND ANALOG DEVICE CONNECTION.

### 3.0 AIC INPUTS.

AIC inputs come from analog devices and are used to control the CMI. The user controls the interface by making patches on the input side of Page A. Figure 1 shows the default patches for inputs. Inputs 1-16 have assignments patched to 'OFF' and ranges patched to 'U' meaning 'undefined'. Each input 1-16 corresponds to an AIC input channel.

### 3.1 INPUT TYPES.

Inputs to the AIC can be assigned to four types of CMI control. These input types are discussed below.

#### 3.1.1 PITCH INPUTS.

Analog device inputs can be used to control the pitch of one or more CMI channels. This could be set up as follows:

- a) connect the analog input to the desired AIC input channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC input channel
- c) light pen hit PITCH then the desired CMI channel number  
(alternatively, type H then the desired CMI channel number then the SET key).
- d) tab to the range field
- e) specify 1 volt/octave; type 1 then the SET key

Now when the selected CMI channel is playing, the pitch will be controlled by the analog input.

### 3.1.2 TRIGGER INPUTS.

Analog inputs can be used to simulate CMI key release/depression for one or more CMI channels. This could be set up as follows:

- a) connect the analog input to the desired AIC input channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC input channel
- c) light pen hit TRIGR then the desired CMI channel number (alternatively, type T then the desired CMI channel number then the SET key).
- d) tab to the range field
- e) determine the voltage the analog device will produce to represent a key depression, say 5 volts, then type 5 then the SET key.

Now key depressions and releases for the selected CMI channel will be simulated by the analog device.

### 3.1.3 CONTROL INPUTS.

Analog devices can be used to simulate CMI CNTRLS for use on Page 7. This could be set up as follows:

- a) connect the analog input to the desired AIC input channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC input channel
- c) light pen hit CNTRL then the desired CNTRL number (alternatively, type C then the desired CNTRL number then the SET key).
- d) tab to the range field
- e) determine the voltage the analog device will produce to represent full scale CNTRL value, say 5 volts, then type 5 then the SET key.

Now CMI level, vibrato speed etc. could be controlled by the analog device by performing appropriate Page 7 settings..

### 3.1.4 SWITCH INPUTS

Analog devices can be used to simulate CMI SWITCH's for use on Page 7. This could be set up as follows:

- a) connect the analog input to the desired AIC input channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC input channel
- c) light pen hit SWITCH then the desired SWITCH number (alternatively, type S then the desired SWITCH number then the SET key).
- d) tab to the range field
- e) determine the voltage the analog device will produce to represent SWITCH ON value, say 5 volts, then type 5 then the SET key.

Now CMI portamento on/off, sustain on/off etc. could be controlled by the analog device by performing appropriate Page 7 patches.



INDEX  
COMMAND:

\*\* PAGE A - READY \*\*

AIC FILE: .AI

INPUT	ASSIGNMENT	RANGE	OUTPUT	ASSIGNMENT	RANGE
1	OFF	U	1	TRIGR1	5
2	OFF	U	2	PITCH1	1
3	OFF	U	3	OFF	U
4	OFF	U	4	OFF	U
5	OFF	U	5	OFF	U
6	OFF	U	6	OFF	U
7	OFF	U	7	OFF	U
8	OFF	U	8	OFF	U
9	OFF	U	9	OFF	U
10	OFF	U	10	OFF	U
11	OFF	U	11	OFF	U
12	OFF	U	12	OFF	U
13	OFF	U	13	OFF	U
14	OFF	U	14	OFF	U
15	OFF	U	15	OFF	U
16	OFF	U	16	OFF	U

PITCH: TRIGR: KEYVL: CNTRL: SWTCH:  
1 2 3 4 5 6 7 8

FIGURE 2 SAMPLE SETUP

### 3.2 INPUT EXAMPLE.

Suppose you wish to have CMI channels 7 and 8, and CNTRL5 and CNTRL6 and SWITCH4 to be controlled by analog devices. This could be accomplished as follows:

- a) connect the analog device to be used to control CMI channel 7 pitch to AIC input 1.
- b) connect the analog device to be used to trigger CMI channel 7 to AIC input 2.
- c) connect the analog device to be used to control CMI channel 8 pitch to AIC input 3.
- d) connect the analog device to be used to control CMI channel 8 to AIC input 4.
- e) connect the analog devices to be used to provide CMI CNTRL values to AIC inputs 5 and 6.
- f) connect the analog gate to AIC input 7.
- g) assuming all devices are 10 volt, patch page A as shown in figure 3.

### 3.3 SPECIAL CONSIDERATIONS FOR INPUTS.

In addition to voltage compatibility and wiring considerations the following things should be considered when using the AIC.

#### 3.3.1 CHANNEL CONFLICTS.

It is not recommended that a CMI channel be controlled by an analog device and the music keyboard (or MCL) simultaneously.

### 4.0 AIC OUTPUTS.

AIC outputs are generated by the CMI and used by the AIC to control analog devices. The interface is controlled by the user by making patches on the output side of Page A. Figure 1 shows the default patches for outputs. Outputs 1-16 have assignments patched to 'OFF' and ranges patched to 'U' for 'undefined'. Each input 1-16 corresponds to an AIC input channel.

#### 4.1 OUTPUT TYPES.

The CMI can generate 5 types of output for use in controlling analog devices. These types are described below.

##### 4.1.1 PITCH OUTPUTS.

The CMI can control the pitch of an analog device. This could be set up as follows:

- a) connect the analog device's VCO to the desired AIC output channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC output channel
- c) light pen hit PITCH then the number of the CMI channel which will control the pitch (alternatively, type H then the desired CMI channel number then the SET key.
- d) tab to the range field
- e) specify 1 volt/octave; type 1 then the SET key

Now the Specified CMI channel controls the pitch of the analog device.

##### 4.1.2 TRIGGER OUTPUTS.

INDEX  
COMMAND:

\*\* PAGE A - READY \*\*

AIC FILE: .AI

INPUT	ASSIGNMENT	RANGE	OUTPUT	ASSIGNMENT	RANGE
1	PITCH7	1	1	OFF	U
2	TRIGR7	10	2	OFF	U
3	PITCH8	1	3	OFF	U
4	TRIGR8	10	4	OFF	U
5	CNTR15	10	5	OFF	U
6	CNTRL6	10	6	OFF	U
7	SWTCE4	10	7	OFF	U
8	OFF	U	8	OFF	U
9	OFF	U	9	OFF	U
10	OFF	U	10	OFF	U
11	OFF	U	11	OFF	U
12	OFF	U	12	OFF	U
13	OFF	U	13	OFF	U
14	OFF	U	14	OFF	U
15	OFF	U	15	OFF	U
16	OFF	U	16	OFF	U

PITCH: TRIGR: KEYVL: CNTRL: SWTCH:  
1 2 3 4 5 6 7 8

FIGURE 3 INPUT EXAMPLE

CMI key depressions and releases can be used to trigger analog devices. This could be set up as follows:

- a) connect the analog device gate input to the AIC output channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC output channel
- c) light pen hit TRIGR then the number of the CMI channel which will control the gating (alternatively, type T then the desired CMI channel number then the SET key).
- d) tab to the range field
- e) determine the required gating voltage of the analog device, say 5 volts, then type 5 then the SET key.

Now the key depressions/releases for the selected CMI channel control the gating of the analog device.

#### 4.1.3 KEY VELOCITY OUTPUTS.

The key velocity from a CMI channel can be used by the AIC to produce control voltages for analog devices. This could be set up as follows:

- a) connect the analog device to the desired AIC output channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC output channel
- c) light pen hit KEYVL then the desired CMI channel number (alternatively, type K then the desired CMI channel number then the SET key).
- d) tab to the range field
- e) determine the full scale voltage of the analog device, say 5 volts, then type 5 then the SET key.

Now CMI key velocity from the selected CMI channel generates a control voltage to the analog device.

#### 4.1.4 CONTROL OUTPUTS.

A CMI CNTRL can be used by the AIC to produce control voltages for analog devices. This could be set up as follows:

- a) connect the analog device to the desired AIC output channel (see section 2.0)
- b) On Page A tab to the assignment field for that AIC output channel
- c) light pen hit CNTRL then the desired CMI CNTRL number (alternatively, type C then the desired CNTRL number then the SET key).
- d) tab to the range field.
- e) determine the full scale voltage of the analog device, say 5 volts, then type 5 then the SET key.

Now CMI key velocity from the selected CMI channel generates a control voltage to the analog device.

#### 4.1.5 SWITCH OUTPUTS.

CMI SWITCH's can be used to trigger analog devices. This could be set up as follows:

- a) connect the analog device gate input to the AIC output channel (see section 2.7).
- b) On Page A tab to the assignment field for that AIC output channel.
- c) light pen hit SWTCH then the number of the CMI channel which will control the gating (alternatively, type S then the desired CMI channel number then the SET key).
- d) tab to the range field.
- e) determine the required gating voltage of the analog device, say 5 volts, then type 5 then the SET key.

Now the selected SWTCH controls the gating of the analog device.

#### 4.2 OUTPUT EXAMPLE.

Suppose you wish to have CMI channels 7 and 8 control the gating and pitch of analog devices, and CNTRL5 and CNTRL6 and SWTCH4 to provide control voltages for analog devices. This could be accomplished as follows:

- a) connect an analog device VCO to AIC output 1.
- b) connect an analog device trigger to AIC output 2.
- c) connect an analog device VCO to AIC output 3.
- d) connect an analog device trigger to AIC output 4.
- e) connect an analog device VCA's to AIC outputs 5 and 6.
- f) connect an analog device gate to AIC output 7.
- g) assuming all devices are 10 volt and/or 1 volt/octave pitches, then patch page A as shown in figure 4.

INDEX  
COMMAND:

\*\* PAGE A - READY \*\*

AIC FILE: .AI

INPUT	ASSIGNMENT	RANGE	OUTPUT	ASSIGNMENT	RANGE
1	OFF	U	1	PITCH7	1
2	OFF	U	2	TRIGR7	10
3	OFF	U	3	PITCH8	1
4	OFF	U	4	TRIGR8	10
5	OFF	U	5	CNTRL5	10
6	OFF	U	6	CNTRL6	10
7	OFF	U	7	SWTCH4	10
8	OFF	U	8	OFF	U
9	OFF	U	9	OFF	U
10	OFF	U	10	OFF	U
11	OFF	U	11	OFF	U
12	OFF	U	12	OFF	U
13	OFF	U	13	OFF	U
14	OFF	U	14	OFF	U
15	OFF	U	15	OFF	U
16	OFF	U	16	OFF	U

PITCH: TRIGR: KEYVL: CNTRL: SWTCH:  
1 2 3 4 5 6 7 8

FIGURE 4 OUTPUT EXAMPLE



