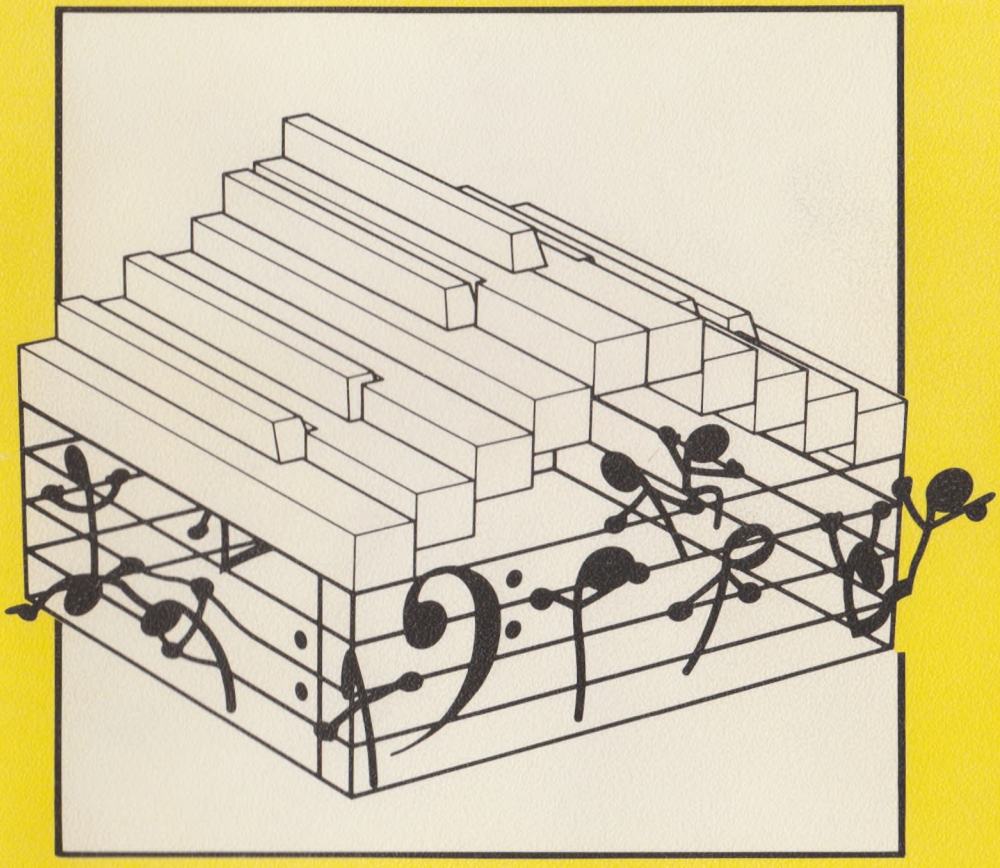
Electrosound 64



ORPHEUS

NEVER·LOOK·BACK...

Electrosound 64

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INTRODUCTION

ELECTROSOUND has been designed for use by people of varying musical knowledge. Anyone who is already familiar with synthesisers will find great scope for creating sounds of all kinds. If you don't know anything about sound synthesis, don't worry because the program comes complete with 50 preset sounds, enabling you to begin playing immediately.

As well as being able to play music manually, the program provides you with a powerful sequencer. This allows you to create music in three parts with sound and tempo changes if required.

There are 24 drum and percussion sounds built into the program which can be played manually or sequenced along with the rest of the music. This means your composition could contain a lead, bass and rhythm part. Because the drum and percussion sounds don't require a channel all to themselves, your music could contain three parts plus drums - the drums being slotted into any available spaces in the three channels.

The sound creating facilities include five types of modulation: Vibrato, Pulse Width Modulation (PWM), Pitchbend, Autotrigger and Filter Cutoff modulation, all of which can be widely adjusted. The eight octave range and the host of other sound features enables the computer's sound output to rival that of synthesisers costing much more than the computer itself. The keyboard can be configured in several different ways. For example, you could have all three channels accessed by a single keypress - and each channel could contain the same or different sounds which could be transposed to any harmonic interval. This means that fat lead or bass sounds can be accessed as well as string ensembles and many other similar voicings.

As well as instrumental sounds being possible, a wide variety of sound effects can be created, in fact ten of the 50 presets are sound effects including Seashore, Machine Gun and Gas Attack !

Any music or sounds created can be saved to either cassette or disk, verified, and loaded back when needed. The program is compatible with the plastic keyboard overlay which is part of the Commodore Music Maker package.

STEVE MELLIN

LOADING THE PROGRAM

CASSETTE VERSION

Before loading the program, switch the computer off then on. Rewind the tape to the beginning. Press SHIFT and RUN/STOP and depress the PLAY key on the cassette unit. Loading is complete when the MENU or TITLE SCREEN is seen on the screen.

Following the program on the tape are five voice files and a music file. Do not rewind the tape if you intend to load any of these.

DISK VERSION

After switching on the computer, type 'LOAD"*",8' then type 'RUN'. Loading is complete when the MENU or TITLE screen is visible on the screen.

CONTENTS OF CASSETTE/DISK

PROGRAM
VOICES 1
VOICES 2
VOICES 3
VOICES 4
VOICES 5
MUSIC DEMO

To hear some of the program's capabilities, load the MUSIC DEMO, then play any TRACK. (Refer to the TAPE/DISK and TRACK/PLAY sections of the manual).

IMPORTANT NOTE

If you are using your Commodore with a television it is essential that you tune in the television as accurately as possible to give the best sound quality. For even better sound quality try connecting the computer to a separate amplifier. Connection details can be found in the Commodore Programmers Reference manual.

MANUAL PLAY

This mode allows the computer to be played manually and operated like a synthesiser: A two octave keyboard is used to play notes or drums, while other keys allow sounds (voices) to be viewed and edited.

THE SCREEN

The top area of the screen contains a keyboard display. It is here that any notes or drums played on the computer's keyboard will be indicated.

The central section contains a grid on which voice parameters are displayed and edited.

The lower part consists of a strip where the voices in use are indicated along with other variables relating to the status of the three sound channels.

THE KEYBOARD

The screen shows which keys are used to produce notes and drum sounds. The chart of drum and percussion sounds gives more information on that subject. If you have the plastic keyboard overlay which comes with Commodore's Music Maker package, you will find that this is compatible with the keyboard layout used in ELECTROSOUND.

Try pressing the 'T' key. Provided the volume is turned up on the TV set or amplifier you will hear the note G. As long as you hold the key down, the black dot remains on the G key on the screen keyboard. Playing each note on the second row of the keyboard from 'Q' to 'I' will produce the scale of C major - All the white notes are on the second row, whilst the black notes are on the top row of the keyboard. The only exception to this is the DEL key which produces the upper B note.

CHANGING VOICES

Make sure the SHIFT LOCK key is not pressed down and play one of the notes on the keyboard. Release it, press the 'A' key and play the note again. You will notice that the sound produced is different the second time because the voice in Channel 1 has been changed. There are ten voices available to you at any one time, and more can be loaded in from tape or disk. When the program is loaded, the voice file present is VOICES 1 which contains a varied selection of sounds. The chart of Voice files shows the voices in VOICES 1 and the other files. If you wish to load any of the other voices files, consult the tape/disk section of this manual.

Each of the three channels can contain a different voice; the 'S' and 'D' keys are used to change channels 2 and 3 respectively.

To play either of the second and third channels you will need to change the KEYBOARD MODE. Consult the chart of keyboard modes to find out what each mode does. The ':' key is used to change this function. Set the keyboard mode to UNISA. Playing one of the note keys will cause all three channels on the screen keyboard to be indicated with dots on the same key. The sound heard will be all three channels in unison. Now use the 'A', 'S' and 'D' keys to set each channel to a different sound. Any of the three channels can be silenced by switching them off. The 'F', 'G' and 'H' keys are used for this purpose. When a channel is switched on, a '+' sign is seen on the green strip at the bottom of the screen. A '-' sign indicates that a channel is switched off.

So far, all the sounds eminating from the computer have been processed by the filter. Although the computer has three sound channels it has only one filter. When the program is loaded, channel 1 is controlling the filter but if you want to have either of the other two channels controlling it, press the ';' key. The cyan coloured area at the bottom of the screen shows which channel is in control. Try playing notes then pressing the ';' key to hear the change in the tone of the sound produced. If you don't want the sound to be processed by the filter at all, each channel can be switched out of the filter with the 'J', 'K' and 'L' keys.

Before going any further, familiarise yourself with the functions covered so far. It will make the next section easier.

CREATING NEW VOICES

While you've been changing the voice numbers in the three channels with the 'A', 'S' and 'D' keys you'll probably have noticed the contents of the blue and white central area of the screen changing. That central area, the VOICE GRID, contains the status of the parameters which combine to give each voice its own distinctive character. It is these factors which need to be adjusted if you wish to create your own voices. Because the parameters can be changed in the MANUAL PLAY mode, you will be able to hear the effect of any changes instantly by pressing any of the note-producing keys on the top two rows of the computer keyboard.

To become familiar with what each parameter does to the sound of a voice, it is a good idea to begin by adjusting one of the existing voices with which you are already familiar. To begin with, use the 'A' key to put Voice 1 into Channel 1; set the keyboard mode to MONO1 and the filter controller to Channel 1. Then make sure that Channel 1 is switched on (+) and that it is routed through the filter (also +). The 'F1' key changes the channel which is currently having its parameters displayed. If the voice grid is not displaying Channel 1's parameters press the 'F1'key until it is. The yellow strip above the voice grid tells you this.

Before any of the voice parameters can be changed, you will need to switch off the WRITE PROTECT function. When the program loads this function is switched on to prevent any accidental changes to the voices. Press 'F2' to switch it off.

At this point you will see the appearance of the EDIT WINDOW next to the word ATTACK at the top left hand corner of the voice grid. Inside the edit window is the current Attack value. At this point it is a good idea to consult the chart of voice parameters to read a description of what effect each parameter has on the sound.

To increase the Attack by one, press 'F3'. Pressing 'F4' increases it by ten. All the numeric parameters are changed like this when a parameter reaches its maximum value, it goes back through zero: Think of it as a circular set of numbers.

When you began with Voice 1 it had a sharp sound; this was because when you played a note the sound began at maximum volume and then reduced until finally the note disappeared altogether. After adjusting the Attack, the sound no longer starts at its maximum volume but takes a while to reach it. This illustrates the relationship between the value of the Attack parameter and what you actually heard; an Attack value of zero means the sound takes no time to reach maximum volume (the original situation), while an Attack of 15 means the sound took several seconds to reach maximum volume. To find out the actual amount of time involved, consult page 466 of the programmer's reference guide or

any other source of information on the Commodore 64's sound facilities. The way in which the volume of a sound varies with time is called the ENVELOPE. There are four parts to the envelope on the CBM 64: Attack, Decay, Sustain and Release. So far we have dealt only with the first part. The chart of voice parameters describes the other three.

To change the DECAY value, first move the edit window down one by pressing 'F7'. The keys 'F3' and 'F4' can now be used to adjust the Decay in the same way the Attack was adjusted previously. You will see that the larger the Decay value, the longer the sound takes to reduce to nothing.

SUSTAIN is different to the other three parts of the envelope. Attack, Decay and Release are all measures of TIME. Sustain is a measure of VOLUME. Increase the Sustain value above the initial value of zero and hold down a note. Once the Attack and Decay parts of the envelope are over, the sound does not decay to silence but remains audible. The higher the Sustain value, the louder the note sounds after the Attack and Decay cycles.

When you release the note, it reduces in volume until it disappears altogether. The length of time this takes is determined by the appropriately named RELEASE part of the envelope. The Attack, Decay, Sustain and Release phases (or ADSR as they are commonly called) work together to form the characteristic envelope of a sound. Use the 'F5' key in conjunction with 'F3', 'F4' and 'F7' to move back and forth until you are satisfied with the result. Now use these keys and the chart of voice parameters to set the other parameters how you wish. The chart describes the effect each parameter has on the sound. Look at how the voices in the five voice files are constructed to see how the voice parameters affect each other. Try changing them to see what difference it makes. In other words, EXPERIMENT.

There may be times when you want to set up two or more voices which are very similar. To save time, there is a facility which allows one voice to be copied into any number of others. At the very bottom of the screen you will see the number of the voice in the BUFFER. At the beginning of the program, the buffer contains voice 0's parameters. To copy a voice into the buffer, make sure it's parameters are being displayed on the voice grid, then press 'V'. The screen shows which voice is occupying the buffer. To copy the contents of the buffer into the new voice, make sure the new voice's parameters are being displayed on the voice grid and press SHIFT'V'. See the voice grid change.

Try the following suggestion.
Set the keyboard mode to UNISA. Set channel 1 to voice 5, channel 2 to voice 6 and channel 3 to voice 7. Make sure all three channels are switched on. Press 'F1' until the yellow strip across the top of the voice grid says

VOICE 5 : CHANNEL 1 : WRITE PROTECT OFF

Now press 'V'. The buffer contains voice 5. Press 'F1' once, then press SHIFT'V'. Voice 6 is now the same as voice 5. To copy voice 5 (in the buffer) into voice 7, press 'F1' and SHIFT'V'. Playing the music keyboard now produces a three-channel unison brass sound.

Press 'F1' twice so that voice 6 is being displayed. Now move the edit window to the Transpose parameter. Press 'F3' until the Transpose value is E4. Press 'F1' again; now change voice 7's Transpose to G4. Any note on the music keyboard now plays a major chord of that particular note, e.g. playing a C will give a C major chord because channel 1 is playing C, channel 2 is playing E and channel 3 is supplying the G note. By adjusting the Transpose values, many other three-note chords or note combinations can be obtained. If voice 6 had been set to D34 instead of E4, the keys would play minor chords instead of majors. It is a good idea to consult a keyboard tutor book to find more chord formations. On the other hand, why not try out your own combinations to construct your own chords (and dischords!).

SYNCHRONISATION AND RING MODULATION

Both of these are selected along with the Waveform. Both require the use of two channels. The two channels work on a master-slave arrangement. The following table shows how the channels work together.

MASTER CHANNEL	SLAVE CHANNEL
1	3
2	1
3	2

Up to now you have always used voices in their own right. Now you will need to think of a voice being used as a slave voice.

It is easiest to use the UNISA mode when working with these effects so that the slave channel "follows" the master when the keyboard is played. You may or may not wish to hear the output of the slave channel. Set the channel switches as you require.

Synchronisation synchronises the frequency of the master with that of the slave. If either has its frequency modulated interesting effects are created.

Ring Modulation only works when a Triangle Waveform is in use. The resulting sounds are very similar to "ringing" sounds such as bells, chimes and cowbells. Again, if the pitch of one channel is swept, the tone of the sound changes.

The best results are obtained when the master oscillator is set to a Transpose value different to the slave. For example, if the master was set to C4 and the slave to F33, a more distinctive sound is obtained than if they were both set to C4.

Playing in a unison mode makes sure the pitch difference remains constant because, as mentioned above, the slave follows the master.

PROCESSING DRUM SOUNDS

So far you have used voices as voices in their own right and as slave voices. The third use of a voice is as a processor of drum and percussion sounds. The idea is that a voice has its Filter settings made to suit the requirements of such sounds as cymbals and snare drums. The voice itself is not heard because the SHIFT key is held down in order to play the drum sounds.

The best course here is to experiment until you find the effect you are looking for. However, as a start you will find that sounds using the noise waveform benefit from going through a high pass filter. You could even modulate the cutoff frequency; the cutoff modulation is triggered by each new drum keypress as long as its trigger mode is set to B.

While you are experimenting with the many voice parameter combinations you will find it helpful to consult the charts of key functions, voice parameters, filters and waveforms.

THE SEQUENCER

ELECTROSOUND contains a powerful sequencer which facilitates the composition of anything from very simple to highly complex pieces of music.

The two main structures involved are SEQUENCES and TRACKS. There are 20 Sequences and 5 Tracks.

Music may be constructed in several separate parts which are then joined to form the finished Track. This is especially useful where one section of a piece is repeated.

A Sequence allows notes and drums to be played in the three sound channels simultaneously. For example, channel 1 could play the melody, channel 2 the bass line with channel 3 supplying the drum part. Each Sequence remembers which voices were used to play the sounds in each channel. It also remembers whether each channel was routed through the filter and which channel was controlling the filter. In addition the Tempo is stored; this can be any value between 000 and 255.

These facilities mean that when Sequences are joined to form a Track, there may be changes in sound and tempo between different sectons of the music. Each Sequence can store up to 240 'steps' in each of the three channels. Because of the length of a sequence, not all of it can be displayed on the screen at once. Each Sequence is therefore divided into SUBSEQUENCES, which can be between 1 and 16 steps in length. A Subsequence can be considered to be a bar of music, but this depends on the tempo setting to a large extent. Because a Subsequence can be set to any length up to 16 steps, it makes composing possible in any time signature. The Sequencer is operated in a manner similar to a tape recorder. Consult the chart of keys used in Sequence Play to find out more. The step number can be thought of as representing the tape counter.

SEQUENCE WRITE

THE SCREEN

The top part of the screen contains the keyboard display. The central area contains the SUBSEQUENCE GRID. Underneath is the green and cyan strip displaying the sound and filter information, while below that is a yellow strip where track number, sequence number, number of steps and tempo are shown. To the right of that is the sequencer CONTROL PANEL.

Reading from left to right, the symbols on the grey control panel represent STOP, PLAY, PAUSE, REWIND and FAST FORWARD. On the extreme right is the counter.

The contents of a subsequence are shown on both the subsequence grid and the keyboard.

ENTERING MUSIC

All the keys used in this section of the program are listed in the SEQUENCE WRITE chart of control keys, which is a useful reference.

To begin, press the sequencer control keys to see what they do. If you press play you won't hear anything because no music is present in the sequencer when the program is loaded. If you hold the rewind key down you will see the counter go from 001 to 240. Pressing fast forward will take it back to 001. You can see that sequences can 'loop'.

Next, use the 'CRSR⇑' key to move the number of steps from 240, through 001 and up to 016. You won't have been able to do this if the counter wasn't on 001. The white arrow beneath the right hand side of the subsequence grid indicates that the subsequence length is 16. Leave it there for now so you will be able to see the whole sequence, whose length you just set to 16 as well.

At the top left of the grid is a white marker which should be next to channel 1. This shows that any music entered will go into that channel. Pressing 'F1' changes this.

The top two rows of the computer keyboard, as used in Manual Play, are used to enter music and drums into the sequence. The space bar is used to enter rests. Try pressing a few keys. You will see that the name of each note is displayed on the grid, while the keyboard also indicates the note on the appropriate key. Drum sounds are shown on the grid by the names of the keys used to produce them, and on the keyboard in the same way as in Manual Play. Move the counter back to 001 and press the '←' key. You will see that the sequence has been cleared and all the other values have been set to their default values. Had you

changed any of the parameters concerned with voice and filter information or the tempo value, they too would have been reset. Enter some more music and drums, tapping the fast forward and rewind keys to move from step to step. Now press PLAY (N). Playing begins from the position of the white dot under the grid and stops at the end of the sequence. To make the sequence play continuously, press the HOLD key (/). A letter H appears next to the sequence number at the bottom left of the screen.

So far all the sounds have been made using voice 0. To change voice numbers, use the 'A', 'S' and 'D' keys in the same way as in Manual Play. The keys 'F', 'G', 'H', 'J', 'K', 'L' and also ';' work in the same way as in Manual Play. The only one which doesn't is the ':' key because the keyboard mode is set to UNISA to allow all three channels to be heard at once.

If you now play the sequence, you will find that when it goes through step 001, all the voice and filter parameters return to their original settings. To make the sequence remember the new settings, press the '=' key. You will see the white bar flash to show that the new settings have been entered. This also applies to the tempo setting, but not to the number of steps and the subsequence length. Drum and percussion sounds can be entered into any of the three channels. This means that in any channel you could have two notes, a drum sound, then more notes, and so on. Therefore you can make efficient use of the channels to produce music which has three instruments PLUS drums.

The note trigger mode has an important part to play in the sequencer. When you enter two notes on adjacent steps, they can sound like two distinct notes (mode B) or one longer note (A). You may need to go back to manual play and switch mode in the voice to get the phrasing you want. If a voice has its note trigger mode set to A, and the decay is short, the second of the two adjacent notes may not be heard because the ADSR is not retriggered. Either switch to mode B or insert a rest between the two notes.

Increasing the tempo can have two uses. The first is simply to speed up the music. The second is to give the music a higher resolution. Say you have a section which takes up 16 steps - making it run twice as fast and last 32 steps doubles the resolution. In other words you can make the instruments play more notes per beat.

When you have finished with one sequence, to start work on another, first return the counter to 001, then use the 'X' (or SHIFT and 'X') key to change the sequence number.

SEQUENCE PLAY

THE SCREEN

The screen is the same as that used in Sequence Write.

PLAYING SEQUENCES

When entering music in the Sequence Write mode, you were able to play it. Sequence Play allows you to play sequences without the risk of accidentally changing the contents of the Sequence.

You will no doubt have noticed in Sequence Write that when you moved from step to step entering music, the sound of each step was heard. This was to help you to enter music in a new channel by allowing you to hear the contents of the other two channels. In Sequence Play, no sound is heard until PLAY is pressed. This allows you to 'cue up' and change Sequences quietly.

TRACK WRITE

THE SCREEN

The Track Write screen is much simpler than the other sequencer screens. The large yellow TRACK GRID is where Sequence numbers are entered. Above the grid is the Track number, and to the right of that is displayed how many sequences are contained in the Track.

When the program starts, all five Tracks contain eight Sequence 00's. Each row on the grid can hold ten Sequence numbers; there are ten rows.

WRITING A TRACK

At the top left hand corner of the grid you will see that the first Sequence number is inside the EDIT WINDOW. The edit window can be moved by pressing the REWIND and FAST FORWARD keys. To change the Sequence number in the edit window, use 'X' and SHIFT'X'.

If you want to delete a Sequence from the Track, move the edit window to the Sequence in question and press 'C'. The Sequence is deleted and the number of Sequences is reduced by one.

To insert a Sequence, move the edit window to where you want the new Sequence to be and press SHIFT'C'. The number of Sequences is increased by one and everything to the right moves right to accommodate the new Sequence. Change the new Sequence number from 00 to whatever you want it to be. You will not be able to insert a new Sequence if the Track already contains the maximum number of 100 Sequences.

To clear a Track to the default settings, place the edit window at the top left hand corner of the grid and press the '←' key.

Finally, to change the Track number, press 'Z' (or SHIFT and 'Z').

Consult the chart of control keys for easy reference while writing a Track.

TRACK PLAY

THE SCREEN

The screen display is the same as in the Sequence Write and Sequence Play modes.

PLAYING TRACKS

To play a Track all you need to do is select the Track number with the 'Z' and SHIFT'Z' keys, then press the PLAY key on the Sequence control panel. If you don't want to play the Track from the beginning use the FAST FORWARD and REWIND keys to move from the start of the first Sequence in the Track to the start of the second and so on.

When a Track has finished playing it will 'park' at the beginning of the last sequence in the Track. To play the Track again, rewind it to the beginning.

Notice that, as in the Sequence Play mode, silent winding is possible. This is necessary if you want to record the Track onto tape - any noise before the recording began would be undesirable.

While a Track is playing you can, if you wish, make a Sequence loop by pressing the HOLD key (/). The Track will continue as programmed only if you press the same key again to release it.

A strong feature of ELECTROSOUND is that voices and tempo can be set differently for each sequence. This feature really comes into its own when playing a Track containing changing voices and tempo to change from a fast raucous section to a slow, melodic passage in the music and vice versa. The possibilities are all there for you to exploit. Go to it !

TAPE/DISK

This part of the program enables voices and pieces of music to be saved to and loaded from either tape or disk. Whenever you select this option from the MENU, the screen will show the TAPE/DISK Menu. You will see that there are three SAVE options which allow you to save either music (Sequences and Tracks), voices, or both music and voices together. The latter option is probably the most useful of the two music saving options since it allows you to keep the sounds used in a piece of music in the same file as the music itself. Once a file has been saved, it is possible to make sure that it was saved correctly by VERIFYing it. This function compares the contents of the tape or disk file with the contents of the computer's memory. Be sure not to change any of the music or voice parameters between saving and verifying or you are certain to get a VERIFY ERROR. The LOAD option, like the verify option does not require you to tell the computer whether you are dealing with a voice, music or music and voice file. The computer can tell which type of file it is by reading the information contained in the file itself.

Whichever of these options you select, you will be asked to enter a DEVICE NUMBER and a FILENAME.

DEVICE NUMBER

This is a means of telling the computer whether you are using a cassette deck or a disk drive. There are three possible device numbers in this case. They are 1 for cassette and 8 or 9 for disk. Most disk drives are set internally to a device number of 8, but 9 is also possible. Press 'RETURN' when you have entered the device number.

FILENAME

This is a means of identifying different files. It also enables you to remember at a later date what a file contains. For example, the filename 'GREENSLEEVES' is much more informative than 'FILE1'.

It is possible to omit the filename when dealing with cassette, but you should always use one when saving a file. Omitting the filename when loading from cassette is a way of finding out the name of the next file on the tape if you forgot to write it down on the inlay card when you saved it.

It is not possible to leave out the filename using disk. If you do you will get a MISSING FILENAME error.

The filename can be up to 16 characters long. The 'DEL' key can

be used to correct any typing errors. Press 'RETURN' when you have finished typing the filename.

If, during entry of device number or filename, you decide that you don't want to go ahead with the tape or disk operation, pressing the '←' key will get you back to the Tape/Disk Menu.

USING CASSETTES

When the filename has been entered, the screen will tell you which keys to press on the cassette deck. It will not do this, however, if one of the tape keys (except STOP) is already down when you press 'RETURN' to enter the filename.

When the tape activity is over, the screen will inform you if any error conditions arose. Consult your computer manual for an explanation of the error messages.

USING DISKS

Before attempting to use the disk drive, make sure it is hooked up to the computer and is switched on. When 'RETURN' is pressed to enter the filename, the disk activity begins immediately.

As well as the standard error messages produced by the computer, there may also be errors reported by the disk drive. To distinguish them, disk messages are printed in reverse text.

Sometimes the computer will report an error while the disk drive reports 'OK'. This would happen if a VERIFY ERROR occurred. Don't be confused by this; it's the computer's job to detect this type of error - the disk drive is merely saying that nothing wrong happened at its end of the line.

Don't attempt to save onto the program disk or you will get a WRITE PROTECT ON error message from the drive.

Consult the disk drive manual for an explanation of any error messages about which you are unsure.

FURTHER SUGGESTIONS

SOUND QUALITY

Although a television speaker does an adequate job of reproducing the sounds from your computer, you will get a much better result if you use some other means of amplification, a HiFi amplifier for example. Run a DIN lead from the Audio/Video socket of the computer to the amplifier.

USING A TAPE RECORDER

If you have a HiFi system containing a cassette deck or an open reel tape recorder it should be relatively simple to make tape recordings of music produced from the computer. If you have some means of overdubbing, then so much better. Although the program allows you to compose music in three parts, you may wish to add more parts to a piece. The first 'take' could be a manual performance or a sequence you have created. Any overdubs could be done manually or by using the sequencer in the following way:

i) Enter the new parts into a sequence via the Sequence Write Mode. Don't bother about timing.

ii) Tap the FAST FORWARD and REWIND keys while still in the Sequence Write mode so that the new part of the music is played in time with the first. Using this method, chords could be stored in a Sequence and overdubbed in exactly the timing you want simply by tapping a key to change from one chord to the next. Include rests in the music where you want the output from the computer to cease while overdubbing.

iii) Repeat (i) and (ii) until you have added all the parts to the music on tape.

VOICE FILES

VOICES 1 (MASTER GROUP)

0	Lead Synth 1
1	Piano 1
2	Electronic Tom
3	Synth Bass 1
4	Clarinet
5	Brass 1
6	Strings 1
7	Clarinet
8	Chime/Random
9	Synth Trigger

VOICES 2 (SIMULATIONS)

0	Organ 1
1	Piano 2
2	Musical Box
3	Bass 1
4	Flute
5	Brass 2
6	Strings 2
7	Banjo
8	Jazz Guitar
9	Backwards Guitar

VOICES 3 (SIMULATIONS)

0	Organ 2
1	Piano 3
2	Whistling
3	Bass 2
4	Oboe
5	Brass 3
6	Strings 3
7	Harpiscord
8	Harp
9	Voice

VOICES 4 (SYNTH SOUNDS)

0	Lead Synth 2
1	Lead Synth 3
2	Lead Synth 4
3	Synth Brass
4	Synth Clarinet
5	Synth Bass 2
6	Synth Bass 3
7	Misc. Synth 1
8	Misc. Synth 2
9	Misc. Synth 3

VOICES 5 (EFFECTS)

0	Seashore
1	Bomb
2	Siren
3	Train
4	Bouncing Ball
5	Machine Gun
6	Clapping
7	Red Alert
8	Gas Attack
9	Volcano

DRUM and PERCUSSION SOUNDS

KEY	SOUND
SHIFT + Q	Bass Drum 1
" 2	Bass Drum 2
" W	Snare Drum 1
" 3	Snare Drum 2
" E	Snare Drum 3
" R	Electronic Snare 1
" 5	Electronic Snare 2
" T	Electronic Snare 3
" G	Electronic Tom 1
" Y	Electronic Tom 2
" 7	Electronic Tom 3
" U	Electronic Tom 4
" I	Electronic Tom 5
" 9	Electronic Tom 6
" O	Cowbell 1
" 0	Cowbell 2
" P	Block 1
" @	Block 2
" -	Crash 1
" *	Crash 2
" £	Crash 3
" ⇑	Cymbal
" HOME	Closed Hihat
" DEL	Open Hihat

KEYBOARD MODES

MODE	DESCRIPTION
MONO1	Every key pressed causes the sound in channel 1 to be heard.
MONO2	Similarly, channel 2 is played.
MONO3	Similarly, channel 3 is played.
UNISA	Channels 1,2 and 3 are played simultaneously when a key is pressed.
UNISB	Channels 1 and 2 are played simultaneously.
UNISC	Channels 2 and 3 are played simultaneously.
POLYA	Channels 1, 2 and 3 are played in succession, one at a time.
POLYB	Similarly, channels 1 and 2 are played.
POLYC	Channels 2 and 3

WAVEFORMS

WAVEFORM GRAPHIC	DESCRIPTION
^	Triangle Waveform; mellow in character
/|	Sawtooth Waveform; bright in character
⎍	Pulse Waveform; character varied by Pulse Width
≡≡	Noise Waveform; produces white noise
S	Sync; synchronises oscillator with the channel's slave oscillator.
R	Ring Mod; with Triangle waveform, ring modulates with slave oscillator waveforms can be combined to produce different tone characters.

FILTERS

FILTER GRAPHIC	DESCRIPTION
¬\	Low Pass Filter; frequencies below the cutoff frequency pass unaffected while those above are reduced by 12dB/Octave.
∧	Band Pass Filter; frequencies at the cutoff are passed but those above and below are reduced by 12dB/Octave.
/¬	High Pass Filter; frequencies above the cutoff are passed without attenuation - those below are attenuated.

Filter modes can be combined, e.g. Low + High combine to produce a Band Reject (or Notch) filter.

MANUAL PLAY

KEY(S)	FUNCTION
Top 2 rows of computer keyboard and SPACE BAR	Music Keyboard - keys used and the corresponding notes are shown on the screen. If the SHIFT key is held down, drum sounds are held instead. The space bar is a "rest" key, being the equivalent of releasing a key.
A	Change voice number in channel 1. The voice number increments by one. If the number is nine, pressing A changes the number to zero.
S	Change voice number in channel 2
D	Change voice number in channel 3
F	On/off toggle for channel 1. When channel 1 is switched on, a "+" sign is displayed. Off status is indicated by a "-" sign.
G	On/off switch for channel 2
H	On/off switch for channel 3
J	On/off toggle to select whether channel 1 has its output routed through the filter.
K	On/off filter toggle for channel 2
L	On/off filter toggle for channel 3
RETURN	Exit to MENU
:	Change keyboard mode
;	Change the number of the channel which is controlling the filter
V	The voice whose parameters are currently being displayed into the buffer.
SHIFT + V	The contents of the buffer are copied into the voice whose parameters are currently being displayed.

F1	Change the channel whose voice is having its parameters displayed.
F2	On/off switch for write protect
F3	Fine adjustment to parameter currently being edited.
F4	Coarse adjustment to parameter currently being edited.
F5	Change parameter being edited - moves edit window to last parameter.
F7	Change parameter being edited - moves edit window to next parameter.

SEQUENCE WRITE

KEY(S)	FUNCTION
Top 2 rows of computer keyboard and SPACE BAR	Music keyboard plus drum sound if SHIFT key is held down. Pressing any of these keys causes the corresponding note or drum to be entered into the sequence. Pressing the space bar causes a rest to be entered.
A to L	Operate in the same manner as in MANUAL PLAY to change voice numbers, SWITCH statuses and FILTER statuses.
: and ;	The ":" key does not operate since the keymode is fixed to UNISA to allow simultaneous playing of all channels by the sequencer. The ";" key works in the same way as in MANUAL PLAY.
=	Enters into the sequence the current status of voice numbers, SWCHes, FILTs, FILTER CHANnel, and TEMPO.
F1	Change the channel into which music is being entered.
F5 to F8	Change tempo as in SEQUENCE PLAY
X and SHIFT+X	Change sequence no. as in SEQUENCE PLAY
B to >.	"TAPE RECORDER" controls as in SEQUENCE PLAY
/	HOLD facility as in SEQUENCE PLAY
CRSR ⇑⇓	When on step 001, the number of steps in the sequence can be increased and decreased
CRSR ⇐⇒	When on step 001, the number of steps in a subsequence can be increased and decreased
←	When on step 001, pressing this key will clear the sequence, set the number of steps to 240 and the subsequence length to 16. The tempo is set to 120
RETURN	Exit to MENU

SEQUENCE PLAY

KEY(S)	FUNCTION
X	Reduce sequence number by one. If sequence zone is displayed, pressing X causes sequence 19 to be called up
SHIFT + X	Increase sequence number by one. If sequence 19 is displayed, pressing SHIFT + X causes sequence zero to be called up Sequence number can only be changed when on step 001 of sequence
B N M ,< >.	STOP sequence) PLAY sequence) PAUSE sequence) "TAPE" CONTROLS REWIND sequence) FAST FORWARD sequence)
/	HOLD sequence
F5 F6 F7 F8	Increase tempo by one Increase tempo by ten Decrease tempo by one Decrease tempo by ten
RETURN	Exit to MENU

TRACK WRITE

KEY	FUNCTION
Z and SHIFT + Z	Decrease and increase track number
X and SHIFT + X	Decrease and increase the sequence no. currently in the edit window.
C	Delete the sequence currently in the edit window
SHIFT + C	Insert a new sequence before the one currently in the edit window
,< and >.	Move the edit window around the track
RETURN	Exit to MENU
←	When on the first sequence in the track, this key clears the track to the default values

TRACK PLAY

KEY	FUNCTION
Z	When at the beginning of the track, pressing this key decreases the track number by one
SHIFT + Z	When at the beginning of the track, pressing this increases the track number by one
B to M	STOP, PLAY and PAUSE as in SEQUENCE PLAY
,< and >.	Steps to last and next sequence in the track respectively
/	HOLDS sequence - current sequence loops until released then the track continues onto the next sequence
F5 to F8	Change tempo as in Sequence Play
RETURN	Exit to MENU

VOICE PARAMETERS (1)

NAME	VALUES AVAILABLE	DESCRIPTION
Attack	00 to 15	The time taken for a sound to reach maximum volume.
Decay	00 to 15	The time taken to decrease to the sustain volume
Sustain	00 to 15	The relative volume at which a sound remains until released
Release	00 to 15	The time taken for a sound to reduce from the sustain volume to silence
Waveform	∧ ∧ ⎍ ⇄ ⇄ S R	Different waveforms have different total characteristics. The waveform is the most important contributor to the tone of a sound. The waveforms can be combined to create even more tonal colours. S and R are not strictly waveforms but are effects added to them to synchronise and Ring Modulate them respectively.
Pulse Width	000 to 255	The pulse waveform (⎍) is the only one whose basic tone can be varied at source. It changes the percentage width of the pulse - a 50% pulse is the most mellow sounding. To obtain this set the pulse width to 127. The pulse width may be varied in relation to time (see modulation functions). The value of pulse width has no effect on the sound when the pulse waveform is not selected.
Transpose	C 0 to C 6 including every semitone in between	The numerical element determines which of the seven octaves bottom C on the keyboard begins at. Normally it starts C but it can be any other note such as D# in which case the range of the keyboard would be D# to upper D.'F3' varies the note, 'F4' the octave

Detune	000 to 255	This applies only to channels 2 and 3. Channel 2 is detuned below the note and Channel 3 above it. This function makes UNISON modes sound fatter by tuning them slightly apart.

VOICE PARAMETERS (2)

NAME	VALUES AVAILABLE	DESCRIPTION
Filter	¬ ^ ⌐	The purpose of the filter is to attenuate certain frequency (or pitch) elements in a sound. The chart of filter needs describes each type. Like waveforms, filter modes can be combined.
Cutoff	000 to 255	The Cutoff frequency of the filter determines the pitch where the filter modes described previously take effect. For example, the low pass filter passes all frequencies below the cutoff frequency and attenuates those above it at a rate of 12dB per octave.
Resonance	00 to 25	This feature emphasises frequencies around the cutoff frequency, creating a more distinctive tone to the sound. Sweeping the cutoff frequency with a high resonance value creates some of the classic synthesiser sounds (see modulation of cutoff frequency).

VOICE PARAMETERS (3) - MODULATION

The following are common to all modulation types, except Auto-trigger which has no depth control. Only Pitchbend and Cutoff have a direction.

NAME	VALUES AVAILABLE	DESCRIPTION
Trigger Mode (T)	A and B	This function determines whether the modulation is restarted every time a new note is pressed (B) or only when the voice is selected (A). It works in conjunction with the note trigger mode (see later).
Rate (RA)	00 to 99	This determines how fast a modulation occurs, e.g. how quickly the pitch changes in Vibrato. A rate of 00 switches the modulation off, irrespective of the depth setting.
Depth (DEP)	02 to 99 and S/H (sample and Hold)	The depth setting determines how far modulation goes before stopping or changing direction. See later for a description of S/H.
Direction (part of depth)	+, - or C	If "+" is selected, in Pitchbend for example, the pitch would begin above the note and bend down to it. A "-" setting causes the pitch to start below the note and bend up to it. A "C" (or cyclic) modulation is where the pitch (or other element of the sound) continuously rises above and falls below the centre value.

Modulation Delay	000 to 255	This determines how much time elapses between a note being pressed and modulation occurring.
		The Trigger Mode determines whether this delay is operative before every note is played or only before the first one.

VOICE PARAMETERS (4) MODULATION Continued

NAME	DESCRIPTION
Vibrato	This type of modulation causes the pitch of a note to be continuously changed. It is by nature a cyclic variation, so no direction needs to be set. Vibrato is an important factor in imitating acoustic instruments such as clarinets and violins.
PWM (Pulse Width Modulation)	This also is by nature a cyclic modulation, and causes the width of the pulse waveform to be varied above and below the point set in the Pulse Width part of the voice. It is very useful in re-creating well known synthesiser sounds, and gives a richer nature to the voice.
Pitchbend	This is the second of the two pitch modulations. Its effect is coarser than that of Vibrato, and if set to a cyclic effect can be used as a more pronounced vibrator generator. Pitchbend is essential to many special effects sounds such as sirens. It is also necessary when creating electronic drum sounds and other percussion such as timpani and tablas.

Autotrigger	The purpose of this is to constantly retrigger the ADSR element of the voice. It can be used for anything from machine gun effects to a slow, seashore type effect. It takes effect only as long as a key is pressed. Also, if you are playing in channel 1 and channel 2 has a voice with autotrigger in it, you may hear channel 2 unless you switch it off.
Cutoff	Many classic synthesiser sounds are created by varying the filter's cutoff frequency during the playing of a note. Cyclic variations create a Wah-Wah effect, while a "+" direction can be used for synth bass or lead sounds. A "-" direction can be useful for such things as synth brass.

VOICE PARAMETER (5) MODULATION Continued

S/H (SAMPLE AND HOLD)

This feature is created by a constantly changing series of numbers being samples and fed into a particular voice parameter and held there until the next sample is taken. This facility is often used to create "random" synthesiser noises. However, to provide more flexibility the sample and hold need not be entirely random.

The numbers are sampled from the waveform output of channel 3. Therefore you have control over the nature of the S/H effect because you can decide which waveform channel 3's voice contains. If you do want a random effect, channel 3 should contain the noise waveform. To understand the effects of the other three waveforms, think of their shape to visualise how they change with time. The Pulse waveform has the least noticeable effect because it has only two states - on or off.

The drum sounds activated by the "T" and "#" keys use the sample and hold function. To achieve a proper random effect it is a good idea to actually play these sounds in Channel 3 because they use the noise waveform.

GENERAL

When voice parameters are modulated they may pass from a minimum value to a maximum value and vice versa. Relate this to the earlier idea of considering parameter values as a circular set of numbers. This feature is included to allow extra effects to be created. Voice 8 in VOICES 5 demonstrates the bending of the pitch of the noise waveform to the lowest value. When it reaches that point, it suddenly becomes very high pitched, simulating the sound of an explosion followed by escaping gas.

The Modulation Delay facility enables lifelike instrumental sounds to be created, e.g. delayed vibrato is desirable for woodwind and string sounds.

VOICE PARAMETERS (6)

NOTE TRIGGER MODE

This is the last of the voice parameters. Like the modulation trigger modes it can be set to either A or B.

If set to A, the envelope will only be retriggered after a rest (all keys released). If set to B, a new trigger is produced every time a key is pressed. This information is passed to the modulators which, depending on how their trigger modes are set, may or may not restart modulating.

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ELECTROSOUND 64 - AMENDMENTS TO MANUAL

Page 3 - CASSETTE VERSION
Loading is complete when the MENU is seen on the screen. Now press the STOP key on the cassette unit.

Page 3 - DISK VERSION
Loading is complete when the MENU is visible on the screen.

Page 8 - 2nd Paragraph 9th line : If voice 6 has been set to D#4

Page 9 - 6th Paragraph 3rd line: ...and the slave F#3

Page 20- VOICES 1 (MASTER GROUP) : 7 CLAVINET
VOICES 4 (SYNTHSOUNDS) : 4 CLAVINET

Page 22- WAVEFORMS, bottom section: ..., ring modulates with slave oscillat
-or
Underneath table: Waveforms can be combined to produce different tone characters.

Page 24- MANUAL PLAY, in the FUNCTION column
(1st box)...If the SHIFT key is held down, drum sounds are **heard** instead...
(Penultimate box)...The voice whose parameters are currently being displayed **is copied** into the buffer.

Page 27- SEQUENCE PLAY , under FUNCTION heading:
(1st box)...If sequence zero is displayed...

Page 30- VOICE PARAMETERS , under DESCRIPTION heading:
(2nd box) Different waveforms have different tonal characteristics

Page 31- VOICE PARAMETERS (2) under DESCRIPTION heading
(1st box)...The chart of filter **modes** describes each type...
VOICE PARAMETERS (2) under VALUES AVAILABLE heading
RESONANCE 00 TO **15**

Page 33- VOICE PARAMETERS (4) MODULATION continued, under DESCRIPTION
PITCHBEND ... a more pronounced vibrato generator.

Page 34- VOICE PARAMETERS (5) MODULATION continued:
S/H (SAMPLE AND HOLD) 2nd line: numbers being sampled and fed...
bottom paragraph: by the "T" and "£" keys...

We apologise for any inconvenience that these misprints may have caused. If you discover any further errors we would be delighted to hear of them.

Watch out for our forthcoming ELECTROSOUND COMPILER MODULE which will take your ELECTROSOUND sequence data and turn it into a machine code module for use with your own programs.

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