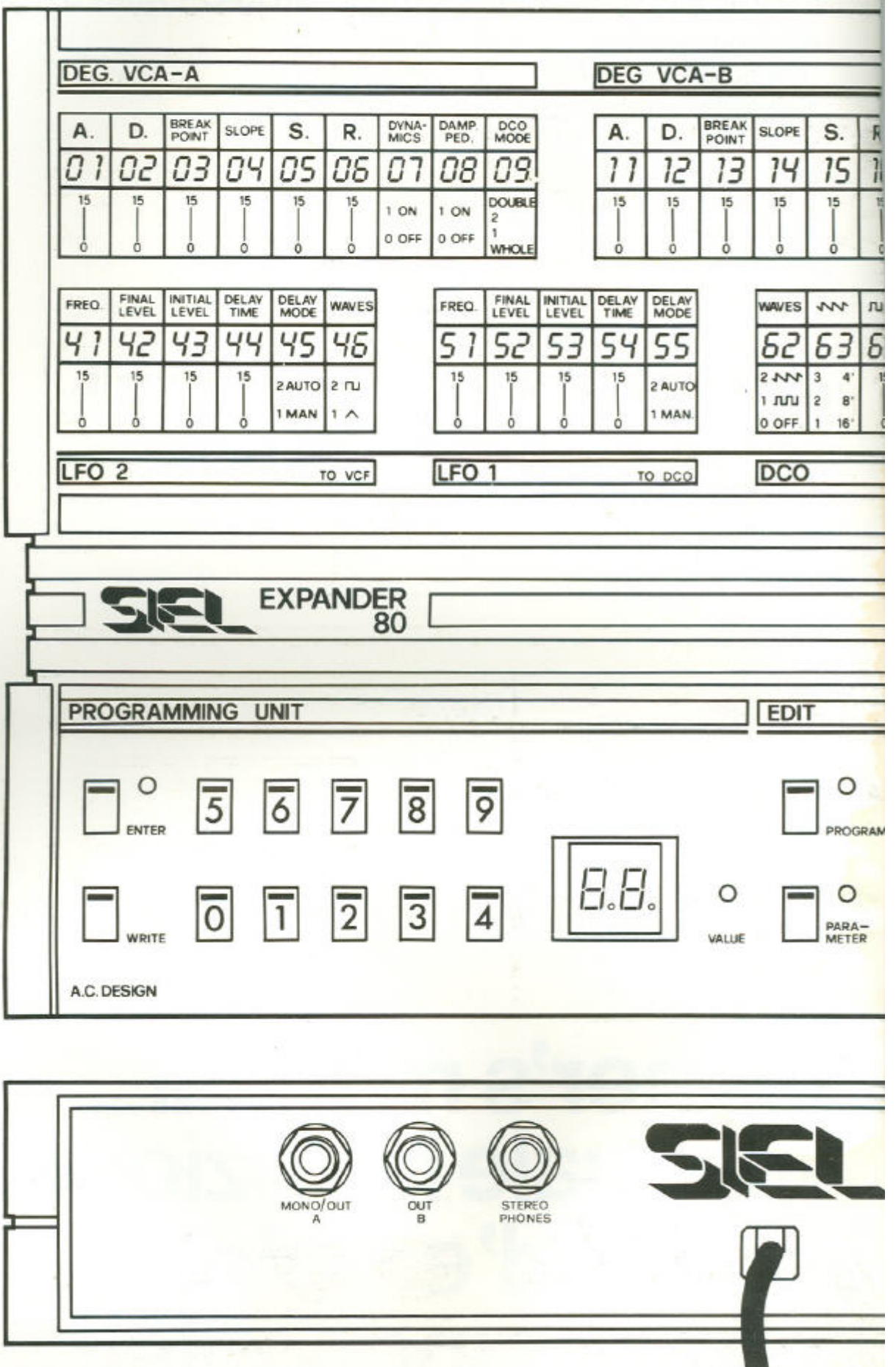
EXPANDER 80

PROGRAMMABLE - DYNAMIC - STEREO - MIDI SYNTH MODULE

SIEL®

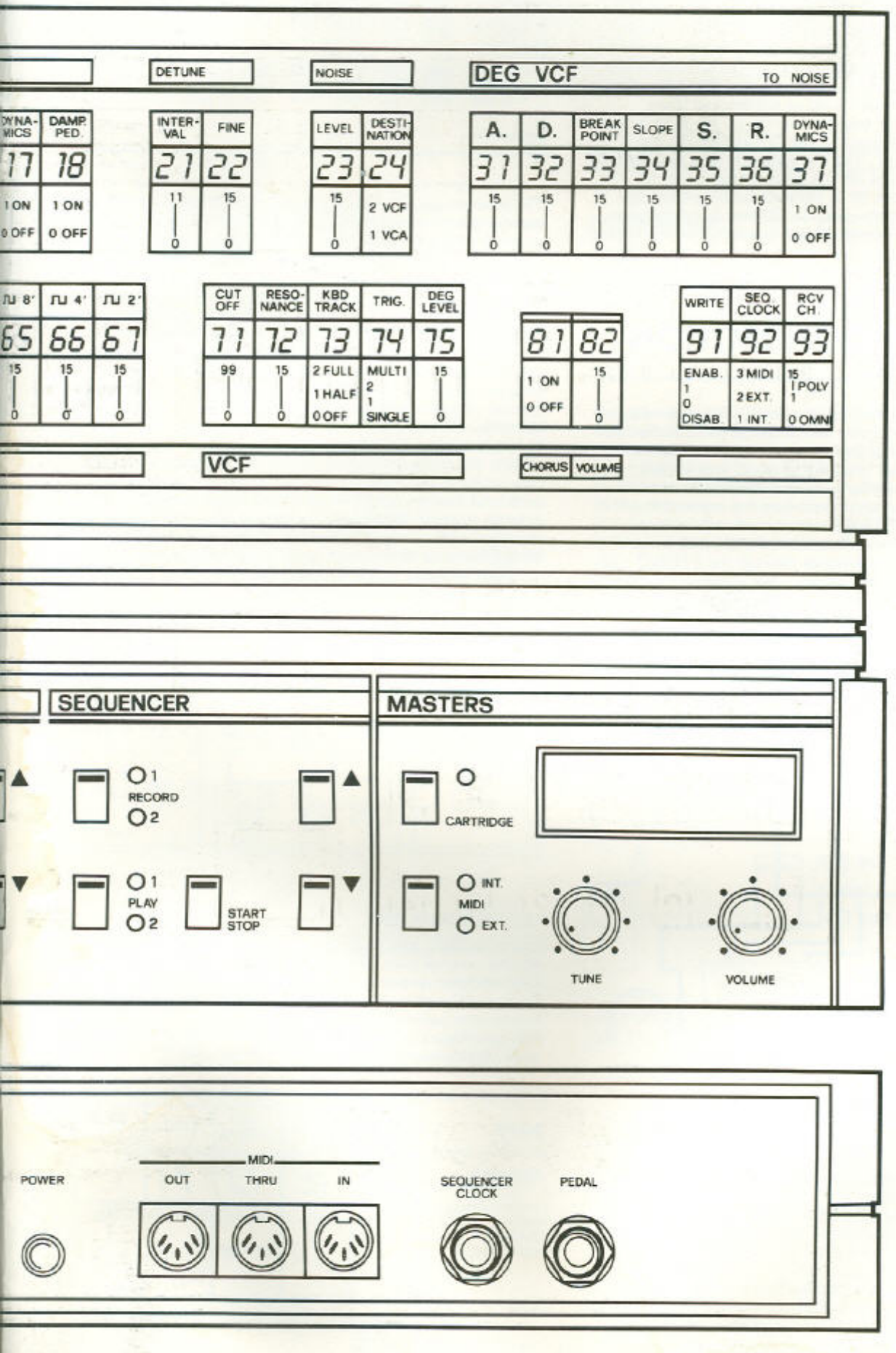
EXPAN

PROGRAMMABLE - DYNAMIC



DER 80

STEREO - MIDI SYNTH MODULE

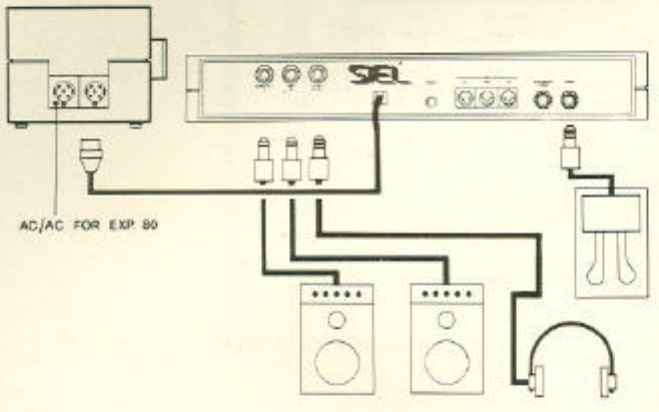


1. INTRODUCTION

The EXPANDER 80 is a polyphonic synthesizer with voice assignment containing 8 complete and invidual synth modules (termed voices or channels).
It is fully programmable and able to store up to 50 programs in its computer memory and groups of 50/100 programs in the RAM/ROM packs (additional memories) which can be inserted into the special CARTRIDGE location. The instrument is provided with 8 oscillators (D.C.O.), 1 pink noise generator, 1 24db/octave low pass Voltage Controlled filter (V.C.F.), 9 digital envelope generators (D.E.G), and 2 low frequency oscillators (L.F.O.) providing parallel modulations of parameters such as pitches and filters.
All this is controlled by specific controls on the EDIT section and memorized in the heart of the EXPANDER 80: the PROGRAMMING UNIT. The Programming Unit also controls the 50 factory programs (40 not programmable and 10 programmable) and the 50 or 100 external programs: 50 (programmable) on RAM pack, or 100 (not programmable) on ROM pack. Thus the DK 80 can control up to 150 musical programs simultaneously: 50 internal ones plus 50 (on RAM) or 100 (on ROM) external ones which are recalled directly by the PROGRAMMING UNIT or by special MIDI functions.

2. POWER CONNECTION

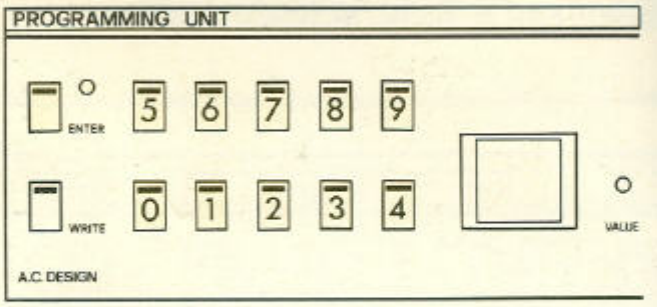
First of all check that the line voltage is in accordance with local voltage.
To switch on the EXPANDER 80 connect to power cable to the external amplifier (if you own a DK 80 connect the cable to the second accessory socket of its amplifier) and then plug in the power cord. Connect the 1/4" jack MONO OUTPUT to the input of an amplifier for a monophonic connection; for a stereophonic connection connect the 1/4" phone jack A/B OUTPOUTS with the inputs of two amplifiers or of a mixer. The instrument may also be connected to stereo headphones through the STEREO PHONES input. If needed, connect the special optional pedal to the PEDAL output. Connect the MIDI OUT of the MIDI keyboard to the MIDI IN of your EXPANDER 80, and vice-versa. Reduce EXPANDER 80's and amplifier's master volume knobs to zero. Switch power on to both devices and set their volumes to an acceptable level (usually the instrument's volume should be 3/4 of maximum level).



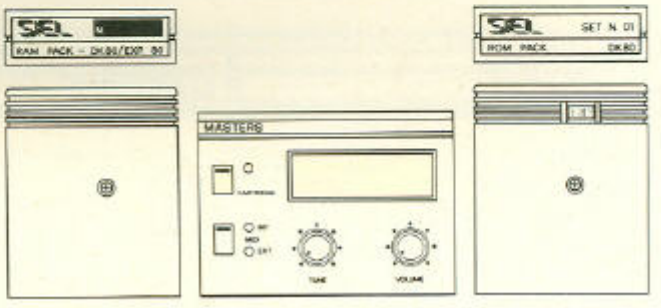
3. PROGRAMMING

3.1 PROGRAM SELECT

On power-up EXPANDER 80 selects for itself the program number corresponding to the last program used (see diplay). The programs are numbered from 00 through 99; to change over to second program simply digit the number desired on the switch panel and then press ENTER on the PROGRAMMING UNIT.
The ENTER function must always follow the new program's data otherwise the display will show the newly recalled program while the instrument is still playing the former one. The ENTER function will be useful to load a program, to be played later. The ENTER LED blinks every time the instrument «waits» for the ENTER command (after recalling a new program to be entered later, or after modifying any timbre in one of the memories).



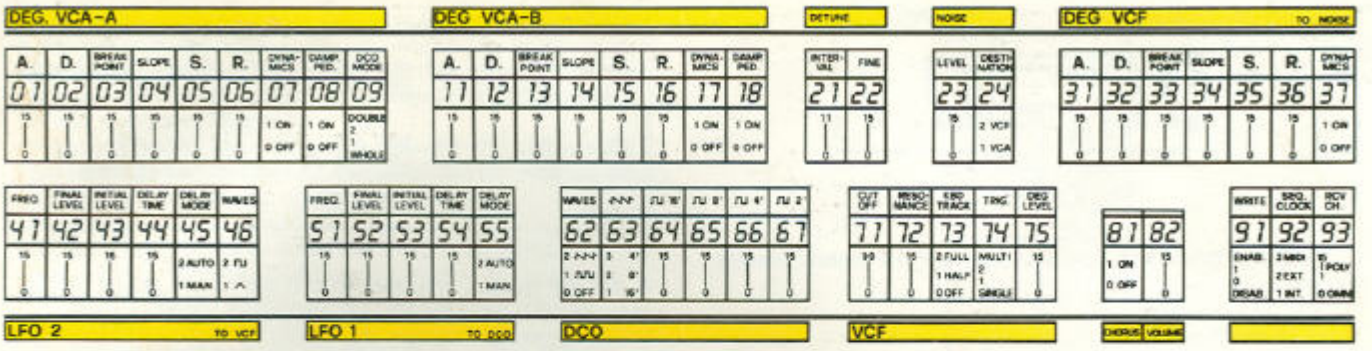
The internal programs are numbered from 00 through 49, the external ones from 50 through 99. To recall an external program (either on RAM pack or on ROM pack) you must enable the CARTRIDGE section with the ON switch (LED lights-up) and digit the program number (is this case any from 50 to 99). In case an external program is recalled with the CARTRIDGE function disabled (LED off), or without having inserted the CARTRIDGE, the display shows the number of the recalled program, while the instrument starts playing one of the internal programs and precisely the program whose number is obtained subtracting 50 from the number of external program recalled. For example: if you select No. 63, corresponding to an external program, without having inserted a CARTRIDGE or without activating the ON switch, the display will show No. 63 but the instrument will play program No. 13 (63 minus 50). If you use an external additional memory on ROM pack (not programmable) it is possible to recall 100 external programs which will always be identified with numbers from 50 to 99; but you may also form 2 banks of 50 programs each (bank L and bank R).
- L (both switches to the left position)
- R (both switches to the right position)



3.2 PROGRAM EDIT

It is possible to edit any program in use (internal from 00 to 49 and external from 50 to 99).
To modifiy or re-memorize a program is very easy.
On the top section of the instrument is a table of the controllable parameters.
The parameters are divided into functional groups and for each parameter the following data are specified:

NAME	CUT OFF	RESO-NANCE	KBD TRACK.	TRIG.	DEG LEVEL
NUMBER	71	72	73	74	75
RANGE OF VALUES	99 — 0	15 — 0	2 FULL 1 HALF 0 OFF	MULTI 2 1 SINGLE	15 — 0
SECTION	VCF				

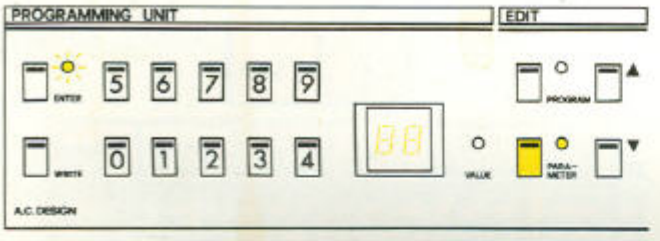


- the Name
- the Number
- the Range of Selectable Values

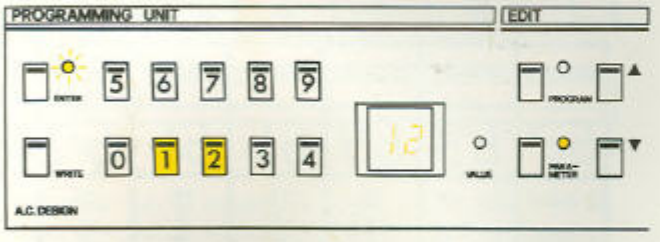
If you wish to change any factory sound parameter, simply press the PARAMETER switch (LED lights-up) on the EDIT section. Once the number of the parameter to be edited has been selected, press ENTER and then edit the value using the ▲ - ▼ tabs.

- The parameters relative to the DEG (Digital Envelope Generators) envelopes of the VCA (Voltage Controlled Amplifiers) A and B range from 01 to 09 and from 11 to 18.
- The parameters of the VCF (Voltage Controlled Filter) envelopes range from 31 to 37.
- The parameters of the LFO 2 (Low Frequency Oscillators) range from 41 to 46.
- The parameters of LFO 1 range from 51 to 55.
- The parameters of the DCO (Digitally Controlled Oscillators) range from 61 to 67.
- The parameters of VCF range from 71 to 75.
- The CHORUS parameter number is 81
- The programmable VOUME parameter number is 82
- The DETUNE parameters are 21 and 22.
- The NOISE parameters are 23 and 24.
- The non-programmable functions numbers are: 91-92-93-94-95.

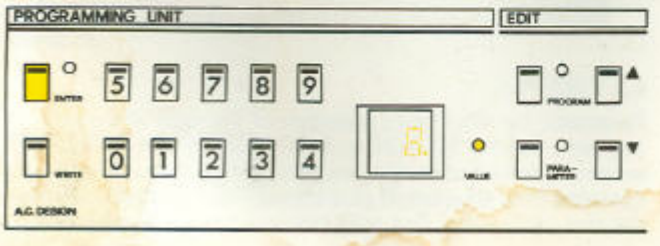
EXAMPLE:
Select the PARAMETER function; the ENTER LED starts blinking and the display shows the number of the last program selected.



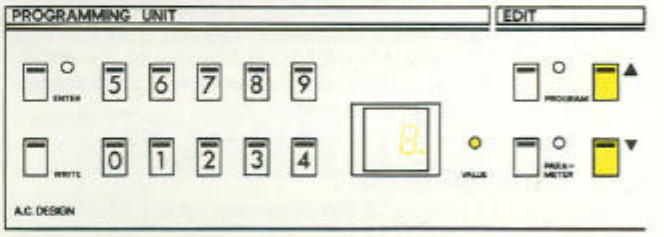
Digit No. 12, corresponding to the VCA A decay time parameter;



pressing ENTER the VALUE LED lights-up and
the display shows the parameter's value in memory which, in this case, may vary from 00 to 15.



Now, with the ▲ - ▼
tabs, you can edit the parameter value.
A decimal point on the right of the number appears on display when in EDIT function.



Going back to PROGRAM switch (LED lights-up) with EDIT function completed, the ENTER LED starts blinking while the display shows the number of timbre in use.
To cancel changes press ENTER; the original sound will be recalled from memory and all the values will be re-assigned to the parameters you had altered.
In conclusion, the display can show:
1) when in PROGRAM position: the number of program in use;
2) when in PARAMETER position: the number of the parameter you wish to edit;
3) when in VALUE position: the number of parameter enabled by the ENTER command.
The LED of each option lights-up when the corresponding function is selected (EDIT section).

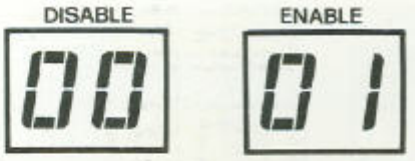
3.3 PROGRAM RECORD

IMPORTANT: on power-up the EXPANDER 80 is not enabled to record new programs.
– SELECT the MIDI INTERNAL function;

– PRESS the PARAMETER switch (EDIT section);
– DIGIT No. 91 corresponding to parameter WRITE (see par. 11) and

WRITE PARAMETER

– PRESS ENTER; No. 00 (DISABLE) appears on display;
– SELECT function 01 (ENABLE) with the ▲ tab.
Now the EXPANDER 80 is ready to record new programs.
(To exit the RECORD phase, switch off the instrument or re-select value 00 following the same operations as described above).



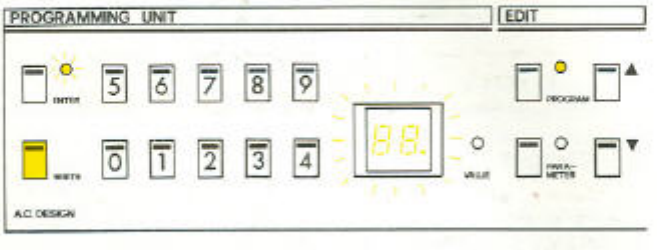
VALUES

— PRESS PROGRAM for visualization of the timbric presets numbers;
— RECALL a preset:
from 00 to 49 or
from 00 to 99 - only if an additional memory has been inserted into the special CARTRIDGE compartment and the ON switch has been activated (LED lit);
— PRESS ENTER;
— SELECT the PARAMETER function; the display shows the parameter numbers;
— SELECT the number of parameter to be edited, for example No. 71 relative to the filter cutoff;
— PRESS ENTER; the VALUE LED lights-up and the display shows the parameter's memorized value which, in this case, ranges from 00 to 99 (see paramater table);
— EDIT the parameter value with the ▲ - ▼ tabs.
Now you may also edit other paramaters, re-setting to PARAMETER. For example:
— DIGIT No. 23 relative to the parameter which controls the pink-noise;
— PRESS ENTER;
— CHANGE, with the ▲ - ▼ tabs, the value shown (in this case from 00 to 15).
In this way it will be possible for you to modify all the parameters you like until you obtain a completely different timbre.
If you wish to record the new sound, remember that YOU CAN RECORD SOUNDS ONLY:
— TO THE SPACE OF INTERNAL MEMORY FROM 40 TO 49 and
— TO THE SPACE OF EXTERNAL MEMORY FROM 50 TO 99 - only in case a RAM pack (programmable additional memory) has been inserted into the CARTRIDGE compartment and the CARTRIDGE ON switch has been activated (LED lit).
Should you attempt to record to an external memory location from 50 to 99 and a ROM pack (not programmable additional memory) has been inserted, CE (Cartridge EPROM) will appear on display to stress that the operation is not possible. So IE (Internal Eprom) and CE (Cartridge Eprom) are the two signals which remind you that the recording operations you are attempting cannot be effected.

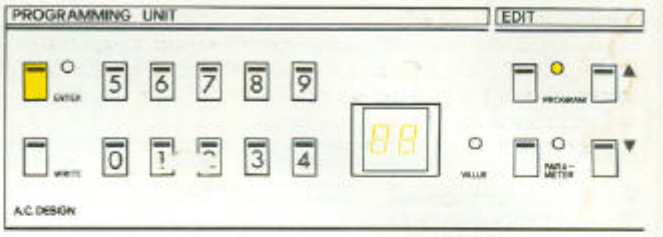
IE=INTERNAL EPROM

CE=CARTRIDGE EPROM

To record all program changes simply:
— Press WRITE: EXPANDER 80 resets to PROGRAM and the number of the edited program starts flashing on display;



— Select the number of program location to which you wish the new timbre to be transferred;
— Press ENTER.



If, for any reason, you wish to exit the record phase before completing it with the ENTER command, simply switch WRITE again; in this way the record function is disabled and the instrument plays the edited program. Switching ENTER the EXPANDER 80 resets to its initial position without affecting the program memory.
WARNING
Before recording a program to any memory location, verify that the location is not occupied by a program you wish to keep memorized.

4. SOUND GENERATORS

This section will enable you to generate audio frequencies and/or noises. It contains a digital oscillator (DCO) which generates a saw-tooth wave at 16' - 8' - 4' and a square wave at 16' - 8' - 4' - 2'. The parameters corresponding to the DCO are 61-62-63-64-65-66-67.
There is also a pink noise generator (NOISE) whose parameters are No. 23 and 24.

4.1 NOISE

The NOISE parameter No. 23 determines the volume of the pink-noise (i.e, the combination of all the frequencies having the same volume energy in every octave of the spectrum). Parameter 24 enables you to choose whether to send the pink noise generation to the VCF section or not.

4.2. D.C.O.

4.2.1 WAVES

Parameter No. 62 enables selection of the type of wave-form you wish to use (SQUARE or SAW-TOOTH) for the synth section. Remember that in case you select a square wave, corresponding to value 01, parameter No. 63 which controls the saw-tooth wave (not selected) will not be enabled and if

recalled its number will not appear on display.
If you select a saw-tooth wave, corresponding to value 02, parameters 64-65-66-67 which control the square wave (not selected) will not be enabled and if recalled their numbers will not appear on display.
In case you select value 00 (wave-forms OFF - no wave form selected) parameters 63-64-65-66-67 will not be enabled, thus the relative numbers will not appear on display.
The WAVES selector enables:
- the saw-tooth wave to enter the VCF/VCA section and the audio output. The saw-tooth wave contains all harmonics with an amplitude which is directly proportional to the number of the harmonic itself;
- the square wave to enter the VCF/VCA section and the audio output. The harmonic content of each footage value (16' - 8' - 4' - 2') is composed of odd harmonics only.
When neither waveform is selected, no signal is addressed to the VCF/VCA section and audio output.

4.2.2. FOOTAGE SELECTION

If the saw-tooth wave is selected, parameter No. 63 adjusts its footage with the following values:
1 = 16'
2 = 8'
3 = 4'

If the square wave is selected, parameters 64-65-66-67 adjust the volume of each octave so as to create the desired harmonic composition:

parameter No. 64 adjusts the volume of 16' from 0 to 15
parameter No. 65 adjusts the volume of 8' from 0 to 15
parameter No. 66 adjusts the volume of 4' from 0 to 15
parameter No. 67 adjusts the volume of 2' from 0 to 15.
The octave selectors transpose oscillators A-B from a minimum of 32.7 Hz (first C - 16') to a maximum of 7902 Hz (last B but one - 2'). The correct pitch for A = 440 Hz will be achieved with the master TUNE knob (MASTERS section).

4. 3 DETUNE

Controls the pitch of the second oscillator with respect to the first. This function is adjusted by parameters 21 (INTERVAL) and 22 (FINE).

4.3.1 INTERVAL

Controls the pitch of the second oscillator with respect to the first for a frequency interval of 61 semitones up. This function is regulated by parameter 21 with values ranging from 00 to 61 and will by enabled only when the instrument is in DOUBLE position (parameter 9 with value 02).

4.3.2 FINE

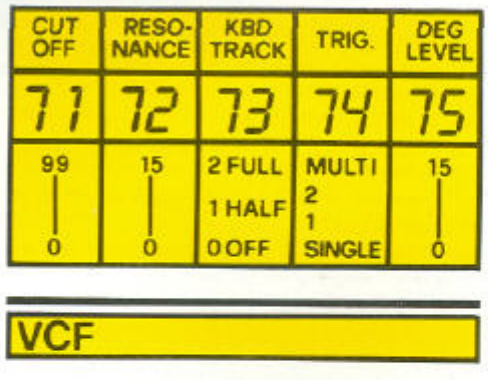
Controls the fine pitch of the second oscillator with respect to the first for a frequency interval of 1/4 tone down. This function is regulated by parameter 22 whose values range from 00 to 15.

RELATION BETWEEN WAVEFORMS AND SOUNDS

The selection of sound waves provides set-up of the synth basic timbre for the creation of different groups of instruments. For example, the saw tooth wave (⋀⋀) which contains odd and even harmonics will be useful to generate strings and brass instrument sonorities. The square wave (⎍⎍) will be useful to create timbres such as the clarinet. The audible differences between waves depend on their different harmonic content. A complex sound (square wave, saw-tooth wave, etc.) is the total of pure sounds (sine waves) in which the basic note (note which determines the pitch) has a single amplitude, and all the others (called harmonic notes) have a different amplitude depending on the harmonic spectrum of the complex wave analyzed.

5. V.C.F. (Voltage Controlled Filter)

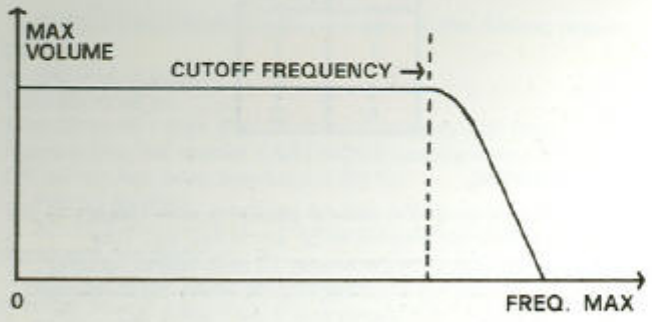
The filter of the EXPANDER 80 is a 24dB/Octave (4 pole) Low-Pass filter.
This section is controlled by parameters 71-72-73-74-75.



5.1. CUTOFF

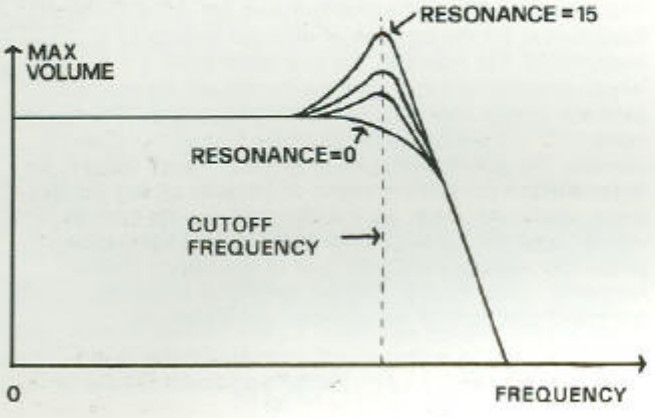
The parameter which controls the CUTOFF is No. 71 (00-99). adjusts cutoff frequency of the 24dB/octave (4 pole) Low-Pass filter. It is rather a tone control. «Cutoff» is the frequency below which all elements of the mixer's output signal are let through. The higher frequency components of the input signal (i.e. all those above the cutoff frequency) are suppressed. The higher the control setting, the higher the

frequencies are which pass through the filter. Thus, the higher the sound. With cutoff tuned on the same frequency as the basic note, you obtain the formation of an almost sine wave (pure wave with no harmonic content). Frequency cutoff set to 0 means no sound output at all.



5.2. RESONANCE

The RESONANCE ('EMPHASIS', 'REGENERATION', or 'Q') adjusts the amount of filter resonance and raises the frequency region round the cutoff, thus increasing the harmonic content of that region. The higher the resonance, the more 'nasal' the sound. This function is controlled by parameter 72 with values from 00 to 15.



5.3 KEYBOARD TRACKING

When on, the keyboard voltage control applies to the filter frequency cutoff. This 'interaction' of the Well-Tempered scale on the filter makes it possible to obtain a changeable consistency of timbre over the whole keyboard range.
This function is controlled by parameter 73 whose values 0-1-2 refer respectively to:
- Keyboard Tracking off (OFF)
- Keyboard Tracking with half the value with respect to the Well-Tempered scale (HALF)
- Keyboard Tracking with the same value as the Well-Tempered scale (FULL).

5.4 TRIGGER

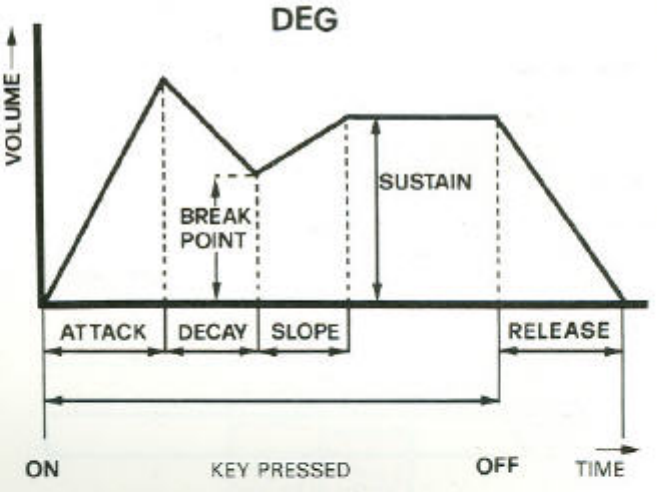
The EXPANDER 80 contains 1 filter.
When you play in polyphonic mode, the filter follows only the first note played in mono mode. The trigger function, controlled by parameter 74 with values 1 (SINGLE) and 2 (MULTIPLE), enables you to choose whether to keep the filter on the first note only or repeat it on all notes played.

5.5 DEG LEVEL

It determines the DEG (Digital Envelope Generator) level on the filter. With AMOUNT set to 00, the envelope has no effect on the filter. This function is controlled by parameter 75 whose values range from 00 to 15.

6. DYNAMICS A.D.B.S.S.R. (Envelope Generators)

The envelope generators A.D.B.S.S.R. apply to the A-B sections of VCA and to the VCF through the ATTACK, DECAY, BREAK POINT, SLOPE, SUSTAIN and RELEASE controls. The envelope voltage generated by the 6 stages (A-D-B-S-S-R) may be used to change a timbre over time (operating VCF) or to modify an amplitude over time (operating VCA). The envelope function is initiated when a key is struck (each note has its individual envelope in VCA, while the envelope is the same for all notes in VCF) and proceeds through its attack, decay and slope periods at a rate determined by the setting of the relative parameters. The sustain level of each note will be determined by the setting of the SUSTAIN parameter; the note will remain at the level set by SUSTAIN until the key is released. When the key is released, the RELEASE function is activated and proceeds at a rate determined by its own parameter value setting.



The DEG (Digital Envelope Generators) parameters of VCA sections A-B are numbered from 01 to 09 and from 11 to 18. The DEG parameters of VCF are numbered from 31 to 37.

6.1 DEG VCA A

DEG. VCA-A

A.	D.	BREAK POINT	SLOPE	S.	R.	DYNA-MICS	DAMP. PED.	DCO MODE
01	02	03	04	05	06	07	08	09
15 / 0	15 / 0	15 / 0	15 / 0	15 / 0	15 / 0	1 ON / 0 OFF	1 ON / 0 OFF	DOUBLE / 2 / 1 / WHOLE

6.1.1 ATTACK

Determines the time for the amplifier of each voice to go from zero level (when one or more keys are initially pressed) to maximum level. This function is adjusted by parameter 01 with values ranging from 00 to 15.

6.1.2 DECAY

Adjusts the length of time for the amplifier of each voice to go back from maximum level (achieved after the attack stage) to BREAK POINT level. If BREAK POINT value is set to 00, the DECAY will fall from maximum level to zero level. If the BREAK POINT is set to the maximum, DECAY will have no effect. This function is controlled by parameter 02 with values from 00 to 15.

6.1.3 BREAK POINT

Determines the level at which the amplifier's decay must stop. This is a level control, not a time control like ATTACK, DECAY, and RELEASE. It is adjusted by parameter 03 whose values range from 00 to 15.

6.1.4 SLOPE

Determines the rate at which the envelope contour moves from the BREAK POINT level to the SUSTAIN level of the amplifier of each voice. It can be either descending, thus functioning as a second decay, or ascending, thus functioning as a second attack. The SUSTAIN level determines the SLOPE. If the SUSTAIN level is higher than the BREAK PONT level, the SLOPE will rise and function as a second attack, while if it is lower the SLOPE will decrease acting as a second decay. The slope function is controlled by parameter 04 with values ranging from 00 to 15.

6.1.5 SUSTAIN

Determines the level which the SLOPE function should reach. In case the SUSTAIN value corresponds to the BREAK POINT value, the SLOPE has no effect. The SUSTAIN, like the BREAK POINT, is a level control and has no connection whatsoever with time. (ATTACK, DECAY and RELEASE are time controls). This function is adjusted by parameter 05 with values from 00 to 15.

6.1.6 RELEASE

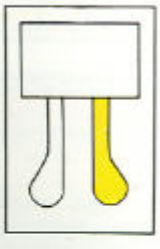
Adjusts the length of time for the amplifier of each voice to go back from Sustain level to zero after the key has been released. If the key (or keys) is released before the Attack, Decay or Slope periods have elapsed, the RELEASE control determines the time taken for the amplifier of each A-B voice to drop to zero from their level when the key was released. If the Sustain level is set to 00 and the Attack, Decay, Slope periods have elapsed, the RELEASE setting is irrelevant, because there is no level for the amplifier to release from. This function is regulated by parameter 06 with values from 00 to 15.

6.1.7 DYNAMICS

The EXPANDER 80 is controlled by a microprocessor which constantly reveals the speed at which the keys of the master synthesizer are struck, which is directly proportional to touch. This data is used to adjust the 'feeling' of a performance, the amplitude of the filters and/or amplifiers of the notes.
This function is adjusted by parameter 07 and activates the keyboard dynamic control on the maximum amplitude of the DEG. The volume will vary depending on the touch.

6.1.8 DAMPER PEDAL (optional)

Enables the envelope automatic function. With parameter 08 and pressing the pedal, it is possible to run across the Attack, Decay, Break Point, Slope, Sustain phases even if the keys are released before their periods have actually elapsed. If you use a DK-80 as master keyboard, you may send this command through MIDI: using the pedal of the DK 80 this function will be enabled on both instruments.



6.1.9 D.C.O. MODE

Using the DOUBLE - WHOLE commands, you will be able to use the 8 voices in two different ways.
With DOUBLE on, the polyphony is reduced to 4 but each note is generated by two oscillators and two DEG serve the VCA section.
Only in this case (DOUBLE on) the DETUNE INTERVAL parameter (21) and all the parameters relative to the second envelope (from 11 to 18) are enabled for the other VCA.
When in WHOLE, the polyphony is of 8 simultaneous notes; each note is generated by one oscillator and the above mentioned parameters are not enabled and if recalled their numbers do not appear on display.
These two functions are controlled by parameter 09 whith values 01 (WHOLE) and 02 (DOUBLE)

6.2. DEG VCA B

THIS SECTION WILL BE ENABLED ONLY WITH PARAMETER 09 SET TO VALUE 02 (DOUBLE).

DEG VCA-B

A.	D.	BREAK POINT	SLOPE	S.	R.	DYNA-MICS	DAMP. PED.
11	12	13	14	15	16	17	18
15 | 0	15 | 0	15 | 0	15 | 0	15 | 0	15 | 0	1 ON 0 OFF	1 ON 0 OFF

6.2.1 ATTACK

Adjusts the length of time for the amplifier of each voice to go from 0 level (when one or more keys are initially pressed) to maximum level. This function is adjusted by parameter 11 with values ranging from 00 to 15.

6.2.2 DECAY

Adjusts the length of time for the amplifier of each voice to go back from maximum level (achieved after the attack stage) to BREAK POINT level. If BREAK POINT value is set to 00, the DECAY will fall from maximum level to zero level. If the BREAK POINT is set to the maximum, DECAY will have no effect. This function is controlled by parameter 12 with values from 00 to 15.

6.2.3 BREAK POINT

Determines the level at which the amplifier's decay must stop. This is a level control, not a time control like ATTACK, DECAY and RELEASE. It is adjusted by parameter 13 whose values range from 00 to 15.

6.2.4 SLOPE

Determines the rate at which the envelope contour moves from the BREAK POINT level to the SUSTAIN level of the amplifier of each voice. It can be either descending, thus functioning as a second decay, or ascending, thus functioning as a second attack. The SUSTAIN level determines the SLOPE. If the SUSTAIN level is higher than the BREAK POINT level, the SLOPE will rise and function as a second attack, while if it is lower the SLOPE will decrease and function as a second decay. The slope function is controlled by parameter 14 with values ranging from 00 to 15.

6.2.5 SUSTAIN

Determines the level which the SLOPE function should reach. In case SUSTAIN and BREAK POINT are set to the same value, the SLOPE has no effect. The SUSTAIN, like the BREAK POINT, is a level control and has no connection whatsoever with time. (ATTACK, DECAY and RELEASE are time controls). This function is adjusted by parameter 15 with values from 00 to 15.

6.2.6 RELEASE

Adjusts the length of time for the amplifier of each voice to fall from Sustain level to zero after the key is released. If the key (or keys) is released before the Attack, Decay or Slope periods have elapsed, the RELEASE control determines the time taken for the filter of each A-B voice to drop to zero

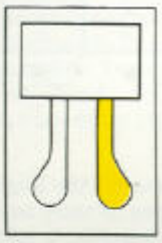
from their level when the key was released. If the Sustain level is set to 00 and the Attack, Decay, Slope periods have elapsed, the RELEASE setting is irrelevant, because there is no level for the amplifier to release from. This function is regulated by parameter 16 with values from 00 to 15.

6.2.7 DYNAMICS

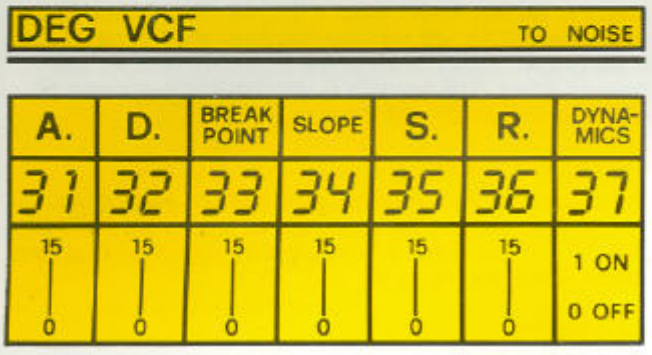
The EXPANDER 80 is controlled by a microprocessor which constantly reveals the speed at which the keys of the master keyboard are struck, which is directly proportional to touch. This data is used to adjust the 'feeling' of a performance, the amplitude of the filters and/or amplifiers of the notes.
This function is adjusted by parameter 17 and activates the keyboard dynamic control on the maximum amplitude of the DEG. The volume will vary depending on the touch.

6.2.8 DAMPER PEDAL (optional)

Enables the envelope automatic function. With parameter 18 and pressing the pedal, it is possible to run across the Attack, Decay, Break Point, Slope, Sustain phases even if the keys are released before their periods have actually elapsed. If you use a DK-80 as master keyboard, you may send this command through MIDI: using the pedal of the DK-80 this function will be enabled on both instruments.



6.3 DEG VCF



6.3.1 ATTACK

Determines the time for the filter of the first note played to go from zero level (when one or more keys are initially pressed) to maximum level. This function is adjusted by parameter 31 with values ranging from 00 to 15.

6.3.2 DECAY

Adjusts the length of time for the filter of the first note played to go back from maximum level (achieved after the attack stage) to BREAK POINT level. If BREAK POINT value is set to 00, the DECAY will fall from maximum level to zero level. If the BREAK POINT is set to the maximum, DECAY will have no effect. This function is controlled by parameter 32 with values from 00 to 15.

6.3.3 BREAK POINT

Determines the level at which the filter's decay must stop. This is a level control, not a time control like ATTACK, DECAY, and RELEASE. It is adjusted by parameter 33 whose values range from 00 to 15.

6.3.4 SLOPE

Determines the rate at which the envelope contour moves from the BREAK POINT level to the SUSTAIN level of the filter. It can be either descending, thus functioning as a second decay, or ascending, thus functioning as a second attack. The SUSTAIN level determines the SLOPE. If the SUSTAIN level is higher than the BREAK POINT level, the SLOPE will rise and function as a second attack, while if it is lower the SLOPE will decrease acting as a second decay. The slope function is controlled by parameter 34 with values ranging from 00 to 15.

6.3.5 SUSTAIN

Determines the level which the SLOPE function should reach. In case the SUSTAIN value corresponds to the BREAK POINT value, the SLOPE has no effect. The SUSTAIN, like the BREAK POINT, is a level control and has no connection whatsoever with time. (ATTACK, DECAY and RELEASE are time controls). This function is adjusted by parameter 35 with values from 00 to 15.

6.3.6 RELEASE

Adjusts the length of time for the filter to go back from Sustain level to zero after the key has been released. If the key (or keys) is released before the Attack, Decay or Slope periods have elapsed, the RELEASE control determines the time taken for the filter to drop to zero from their level when the key was released. If the Sustain level is set to 00 and the Attack, Decay, Slope periods have elapsed, the RELEASE setting is irrelevant, because there is no level for the filter to release from. This function is regulated by parameter 36 with values from 00 to 15.

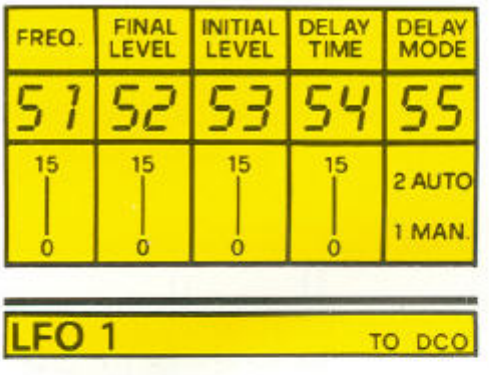
6.3.7 DYNAMICS

The EXPANDER 80 is controlled by a microprocessor which constantly reveals the speed at which the keys of the master synthesizer are struck, which is directly proportional to touch. This data is used to adjust the 'feeling' of a performance, the amplitude of the filters and/or amplifiers of the notes. This function is adjusted by parameter 37 and activates the keyboard dynamic control on the maximum amplitude of the DEG. The volume will vary depending on the touch.

7. L.F.O. (Low Frequency Oscillators)

This section comprises 2 low frequency oscillators which make it possible to obtain modulations of parameters such as PITCH and VCF.

7.1 L.F.O. 1



This section contains a sub-audio oscillator which can be controlled separately with parameters of depth (INITIAL LEVEL - FINAL LEVEL), rate (FREQUENCY), delay time (DELAY TIME) and manual/automatic control (DELAY MODE). The destination of this triangle oscillator is the PITCH of the audio oscillator.
This type of modulation provides a periodic pitch variation, known as VIBRATO.

7.1.1 FREQUENCY

Adjusts the modulation rate of oscillator LFO 1.

This function is controlled by parameter 51 with values from 00 to 15.

7.1.2 FINAL LEVEL

Adjusts the amplitude that LFO 1 will take on as final value after the attack delay (DELAY TIME) if DELAY MODE is in AUTO position, or after pressing the DEPTH tab if DELAY MODE is in MAN. position. This function is controlled by parameter 52 with values from 00 to 15.

7.1.3 INITIAL LEVEL

Adjusts the amplitudes that LFO 1 will take on as initial value either after the attack delay (DELAY TIME) when DELAY MODE is in AUTO, or after pressing the DEPTH tab when DELAY MODE is in MAN. This function is controlled by parameter 53 with values form 00 to 15.

These controls enable you to obtain effects whose modulations a) start as soon as the key is struck and stop with a pre-arranged delay, or b) start only with a certain delay or c) even change their intensity after a pre-arranged delay determined by the delay time command.

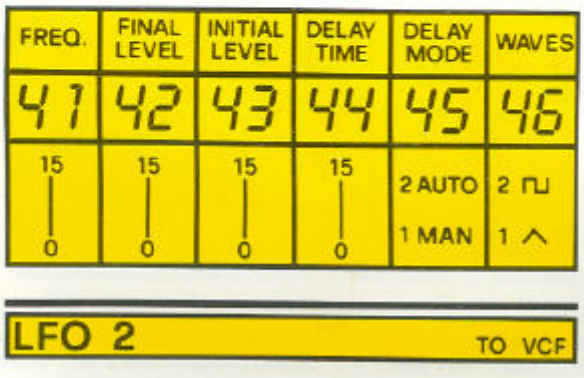
7.1.4 DELAY TIME

When DELAY MODE is in AUTO position, it adjusts the length of delay that LFO 1 should take on as final level. This function is controlled by parameter 54 whose values range from 00 to 15.

7.1.5 DELAY MODE

Selects the type of delay, which may be manual or automatic, of the final level. When in MANUAL position, the modulation final level is enabled manually pressing the DEPTH tab. This function is controlled by parameter 55 whose values are 01 (MAN) and 02 (AUTO).

7.2 L.F.O. 2



This section contains a sub-audio oscillator which can be controlled separately with parameters of depth (INITIAL LEVEL - FINAL LEVEL), rate (FREQUENCY), delay time (DELAY TIME), manual / automatic control (DELAY MODE) and type of wave-form (WAVES). The destination of this oscillator is the VCF.
Sending the LFO 2 modulation source to the filter you obtain a periodic timbre variation.

7.2.1 FREQUENCY

Adjusts the modulation rate of oscillator LFO 2. This function is controlled by parameter 41 with values from 00 to 15.

7.2.2 FINAL LEVEL

Adjusts the amplitudes that LFO 2 will take on as final value after the attack delay (DELAY TIME) if DELAY MODE is in AUTO position, or after pressing the DEPTH tab if DELAY MODE is in MAN. position. This function is controlled by parameter 42 with values from 00 to 15.

7.2.3 INITIAL LEVEL

Adjusts the amplitude that LFO 2 will take on as initial value either after the attack delay (DELAY TIME) when DELAY MODE is in AUTO, or after pressing the DEPTH tab when DELAY MODE is in MAN. This function is controlled by parameter 43 with values from 00 to 15.

7.2.4 DELAY TIME

When DELAY MODE is in AUTO position, it adjusts the length of delay with which the LFO 2 should take on the final level. This function is controlled by parameter 44 whose values range from 00 to 15.

7.2.5 DELAY MODE

Selects the type of delay, which may be manual or automatic, of the final level. When in MANUAL position, the modulation final level is enabled manually pressing the DEPTH tab. This function is controlled by parameter 45 with values 01 (MAN) and 02 (AUTO).

7.2.6 WAVES

Control enabling you to select a triangle wave or a square wave. If you select a triangle wave, you will obtain a periodic linear modulation (first increasing then decreasing) with no discontinuity points. If you select the square wave, you will obtain a periodic modulation with sharp changes from maximum to minimum values, thus with dicontinuity points. This function is controlled by parameter 46 with values 01 and 02. Connecting your Expander 80 to a DK 80 synthesizer, you may send the DEPTH command through MIDI enabling both instruments to this function direct from DK 80.

8. CHORUS

The EXPANDER 80 is provided with a DELAY LINE for CHORUS modulation effects. Enabling this parameter you will obtain a timbric effect similar to two instruments playing at the same time, slightly out of tune with each other. This function is regulated by parameter 81 whose values are 00 and 01.

9. VOLUME

Programmable volume control. It is determined by parameter 82 with values ranging from 00 to 15 and can program the total level of acoustic output so as to obtain the same volume for all presets.

10. MASTERS

MASTERS controls are not programmable.

10.1 VOLUME

Adjusts general volume.

10.2 TUNE

General pitch control (shifts keyboard up or down by about 1 semitone) to tune EXPANDER 80 to other instruments.

TUNE

VOLUME

11. WRITE

This parameter is not programmble. It enables or disables the 'save' function (which protects programs from possible operation errors). This function is controlled by parameter 91 with values 00 (DISABLE) and 01 (ENABLE).
Every time the instrument is switched off parameter 91 resets to value 00 (disable).

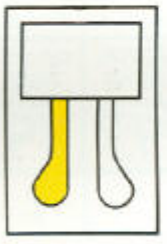
12. SEQUENCER CLOCK

The EXPANDER 80 comprises a 2-track polyphonic Sequencer (see par. 18). The SEQUENCER CLOCK makes it possible for you to select the type of clock you wish to use to record your notes sequences:
1) INTERNAL: the EXPANDER 80 records and/or reads your sequences by its built-in clock (96 beats per bar - 24 for each quarter). In this case the recording and/or reading speed is adjusted with the ▲ - ▼ tabs (SEQUENCER section);
2) EXTERNAL: the EXPANDER 80 reads your notes sequences by an external clock originating from an analogue source (Trigger of another sequencer of Trigger of electronic drums);
3) MIDI: the instrument reads your notes sequences by an external clock originating from a MIDI source (electronic drums MIDI output).
These functions are controlled by parameter 92 whose values are 1 (INTERNAL) - 2 (EXTERNAL) - 3 (MIDI)

13. RCV CH. (Receive Channels)

You have the possibility of selecting the MIDI reception channels of your instrument. In case the EXPANDER 80 is connected for MIDI transmission (see par. 17) and receives external notes, you may select up to 16 different receive channels. In this way, in case of transmission with several channels, EXPANDER 80 receives only the notes and the data in which you are interested. When in 00 position the instrument receives all channels (OMNI mode).
From position 01 through 16 it receives only the selected MIDI channel.

14. PEDAL DEST. (Left pedal destination)



The pedal located on the left of the optional pedal set may be used to accomplish several functions. You may use it to function as:
A) Sequencer START/STOP both in the record and in the playback phases;
B) PROGRAM UP to advance the timbric programs;
C) DEPTH to introduce the modulations programmed in MANUAL mode.
The left pedal functions are controlled by parameter 94 which has the following values:
DEPTH = 1
PROGRAM UP = 2
SEQUENCER START/STOP = 3
The above functions may also be received through MIDI if your EXPANDER 80 is linked with a DK-80.
In this case it is possible to send the SEQUENCER START/STOP command and the PROGRAM UP (for parallel advancing of t. .n DK-80 and EXPANDER 80 programs) directly from the DK-80's pedal.

15. SEQUENCER INTERNAL/EXTERNAL

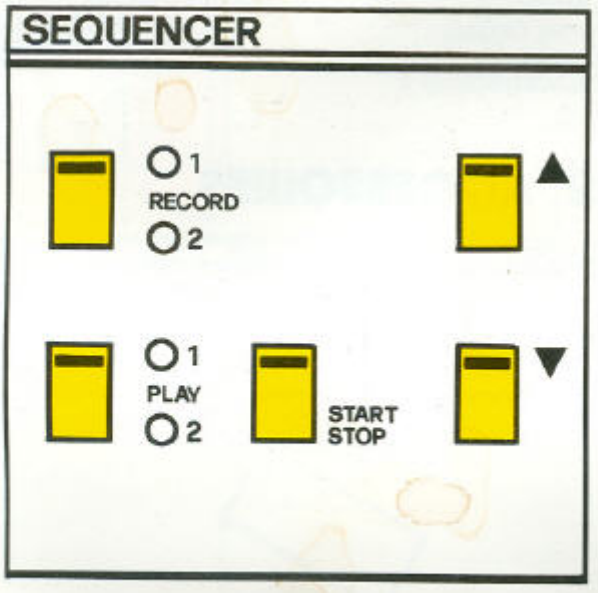
You may use your musical performance sequences playing them from the EXPANDER 80 or sending them to another expander or keyboard, thus leaving your synthesizer free for other executions. This function is controlled by parameter 95 whose values are 00 (INTERNAL) and 01 (EXTERNAL).

16. METRONOME ON/OFF

With sequencer clock in INTERNAL (parameter 92 set to 01) you will be able to follow a metronome in order to compose your perfomances with a precise rhythmic division. This function is activated by parameter 96 with values 00 (OFF) and 01 (ON). To adjust the metronome speed with respect to your execution, use the ▲-▼tabs (SEQUENCER section). Use OUTPUT B.

17. SEQUENCER

The EXPANDER 80 includes a 2-track real-time polyphonic sequencer which can store up to 300 notes. The real-time memorization gives you the possibility of playing normally, as if you were recording to any audio-recorder.
The sequencer quantization results in 96 clock beats for each 4/4 bar, i.e. each quarter note is quantized in 24 clock beats.
To record a musical quarter proceed as follows:
- Verify the sequencer clock is in INTERNAL position (see par. 12).
- Verify the sequencer output is in INTERNAL position (see par. 15).
- Choose whether you want the metronome to be introduced or not (see par. 16).



Now select tracks 1 and 2 (RECORD tab) simultaneously to ensure complete memory erase. The LEDs start blinking and the metronome if activated, stresses the musical quarters. In case you have selected the metronome function, you may adjust the recording speed using the ▲ - ▼ tabs (SEQUENCER section), otherwise the record rate will be adjusted automatically. At this point you can enable the record phase pressing either the START/STOP switch or the left optional pedal (SEQUENCER START/STOP position -see par. 14). The LED of the RECORD 1-2 tab corresponding to track 2 goes off automatically while the one which corresponds to track 1 stays lit showing that the recording on track 1 has started. After recording your musical phrases stop the record phase pressing again the START/STOP tab or the left pedal (SEQUENCER START/STOP pos.); the recorded sequence will be automatically played back. PLAY is automatically selected for track 1. Now you may record also on the second track available. Stop the PLAY function with the START/STOP tab then select RECORD on track 2. Selecting PLAY for track 1 makes it possible to play back at the same time the first track you had recorded.
Remember that as soon as you start recording (after pressing the START/STOP switch or the left pedal when in SEQUENCER START/STOP position), EXPANDER 80 memorizes all events, including pauses.
To record one or more notes on the first bar beat, simply keep them pressed before entering the record phase (i.e. before pressing the START/STOP switch/pedal). Keep in mind that the sequencer memory can be used totally either for track 1 for track 2, thus limiting the next over-recording. This is why we recommend that every time you start a new sequence you select both tracks. Once the record phase is over, EXPANDER 80 automatically selects the PLAY function (play-back) and keeps playing back the recorded musical phrases (LOOP). In case you have used all the memory space, the instrument exits the record phase and the LEDs go off automatically, but the play-back function is not automatically enabled. Pressing PLAY the recorded pieces will be played back, but they will not be looped.

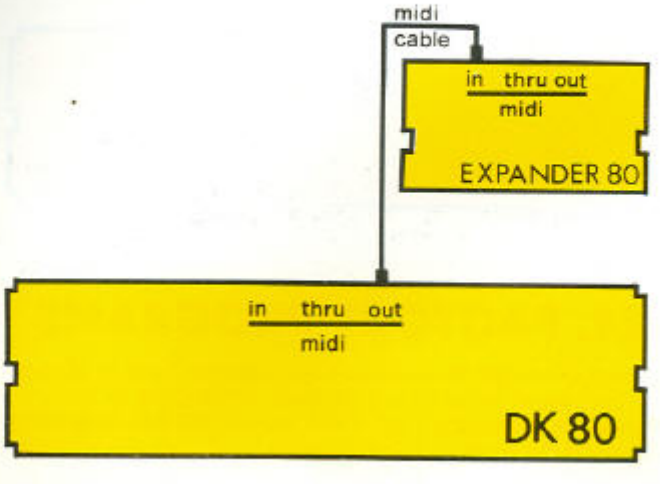
18. M.I.D.I.
(Musical Instrument Digital Interface)

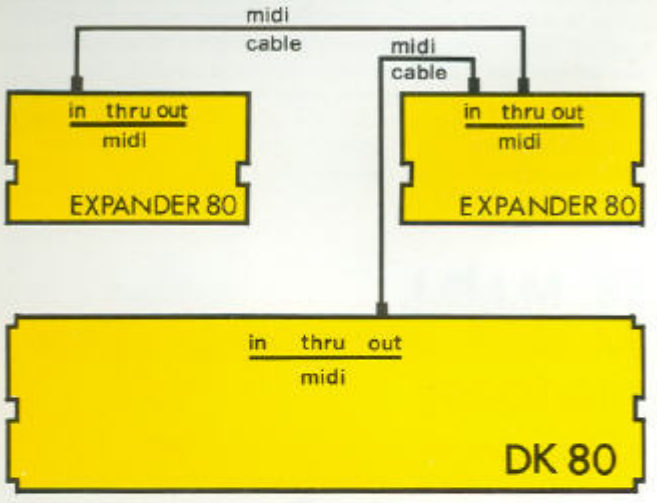
The EXPANDER 80 features a universal interface system used in several applications. The instrument actually communicates with - and is prepared to receive data from - other M.I.D.I. equipped devices. It is possible to make different instruments all play from one keyboard, or to connect your synth to a personal computer, to a poly sequencer, etc. With the MODE switch you can select the INTERNAL, EXTERNAL, INTERNAL/EXTERNAL functions in order to communicate and/or receive possible program changes. If you want to play two synths through M.I.D.I. connect the MIDI input (IN) of one synth to the output (OUT) of the other one, and vice-versa. Now the two instruments are interconnected, ready to communicate with each other and transmit the notes you will play on the keyboard. If you set the EXPANDER 80 MODE switch to EXTERNAL, it will be possible for you to receive program changes from the synthesizer and the control changes relative to the functions of DEPTH, SEQUENCER START/STOP, PROGRAM UP if sent by the DK-80 synthesizer.

19. M.I.D.I. CONNECTIONS

The following diagrams show the most common basic connections:

MIDI SYNTH. + EXPANDER

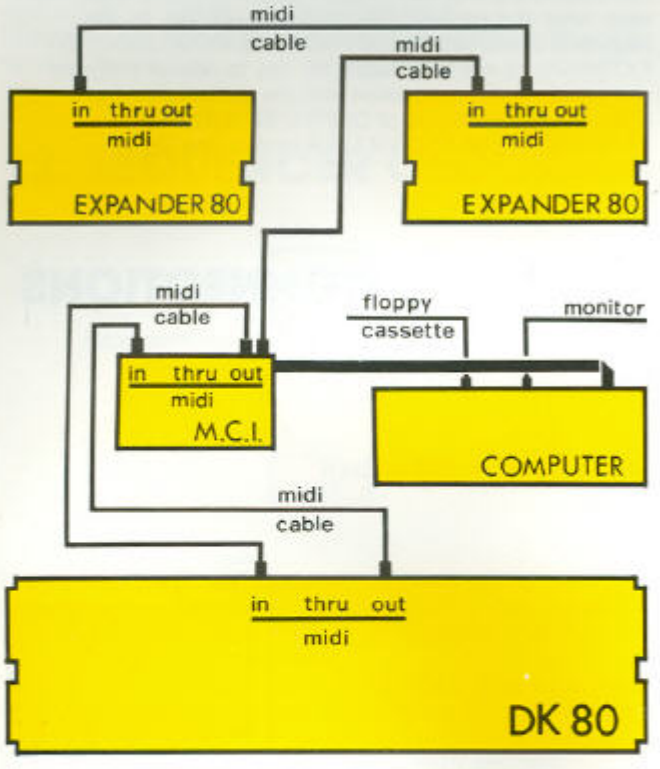




20. CONNECTION TO COMPUTERS

It is possible to connect the EXPANDER 80 to Computers based on CPU Z80, 6502, 6510 (SINCLAIR ZX SPECTRUM, SINCLAIR ZX 81, VIC 20, CBM 64, APPLE II....) through 'SIEL' MIDI COMPUTER INTERFACE (optional). This makes it possible for you, using specific software, to obtain several musical applications by means of the Computer.

COMPUTER + MIDI COMPUTER INTERFACE + EXPANDER



21. FACTORY PROGRAMS

The EXPANDER 80 contains many different types of sounds in its original set of factory patches. While these by no means represent the total of the EXPANDER 80's capabilities, they can be used as a starting point.

00 PIANO 1
01 E-PIANO
02 FAT BRASS
03 STRINGS 1
04 SYNTH CHOP
05 FLUTE
06 TROMBONE
07 ORGAN 1
08 TRUMPET
09 PIANO 5th

10 BACKGROUND 1
11 SYNTH PIANO
12 OCT. BRASS
13 STRINGS 2
14 SYNTH 1
15 LEAD SYNTH 1
16 MARIMBA
17 ORGAN 2
18 REED 5th
19 OCT. STRINGS

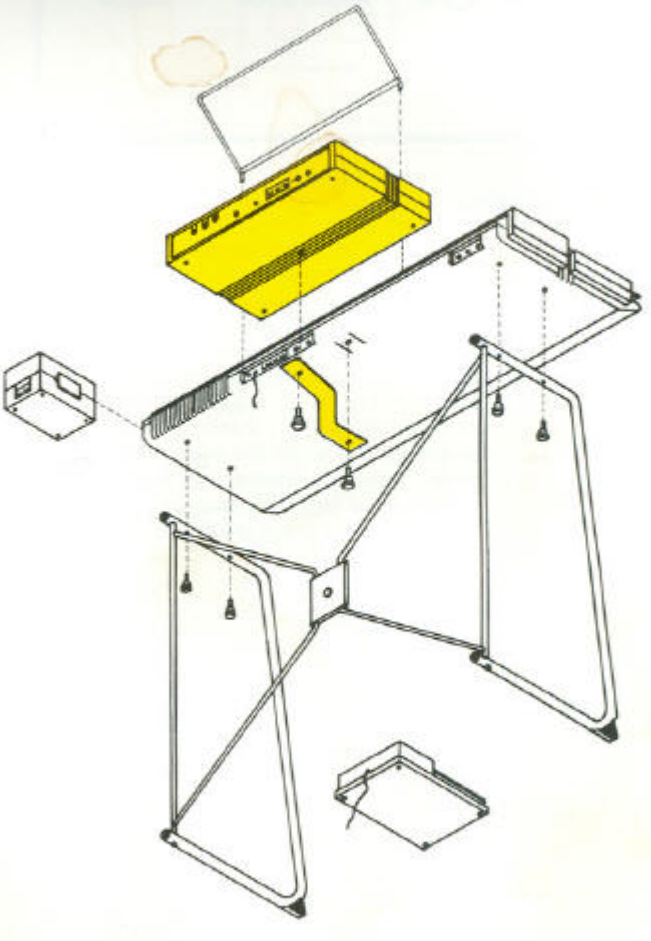
20 OLD TIME PIANO
21 DELAYED 5th
22 BRASS 5th
23 STRINGS 3
24 SYNTH 2
25 PAN FLUTE
26 MUSETTE
27 PIPE ORGAN 1
28 PIANO 4th
29 BACKGROUND 2

30 SYNTH 5th
31 BRASS 4th
32 REED 4th I
33 CELLOS
34 CLARINET
35 BASS 1
36 FLUTE 10th
37 PIPE FLUTE
38 HARPSICHORD
39 REED 4th 2

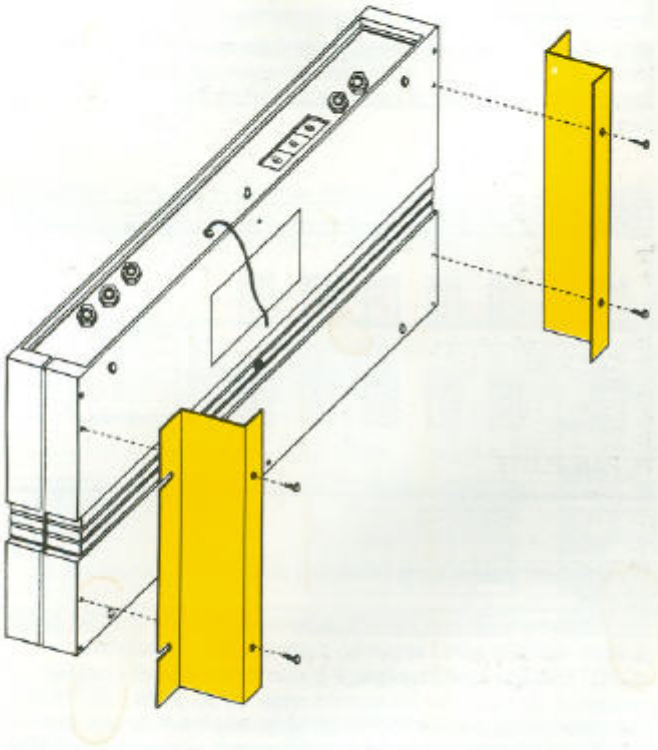
40 HAWAIAN GUITAR
41 ELECTROVOX
42 VIOLINS
43 PIPE ORGAN 2
44 TOY PIANO
45 ORGAN 3
46 DETUNED PIANO
47 LEAD SYNTH 2
48 HELICOPTER
49 SPACE EFFECT

22. ACCESSOIRES

The following accessories will be supplied on request:
- **RAM PACK:** programmable additional memories. With this type of 'CARTRIDGE' it is possible to memorize 50 additional timbric presets and use them directly on line.
- **ROM PACK:** non programmable additional memories. With this type of 'CARTRIDGE' it is possible to have 100 additional presets, already memorized by the factory, directly on line.



- AC/AC Power Supply
- Fixing Bars
- Programmable Multifunction Pedal
- Midi computer interface
- Expander 80 graphic sound editor
- Midi software
- Midi Connection Cables
- 1/4" Jack/Jack Cables



SIEL

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