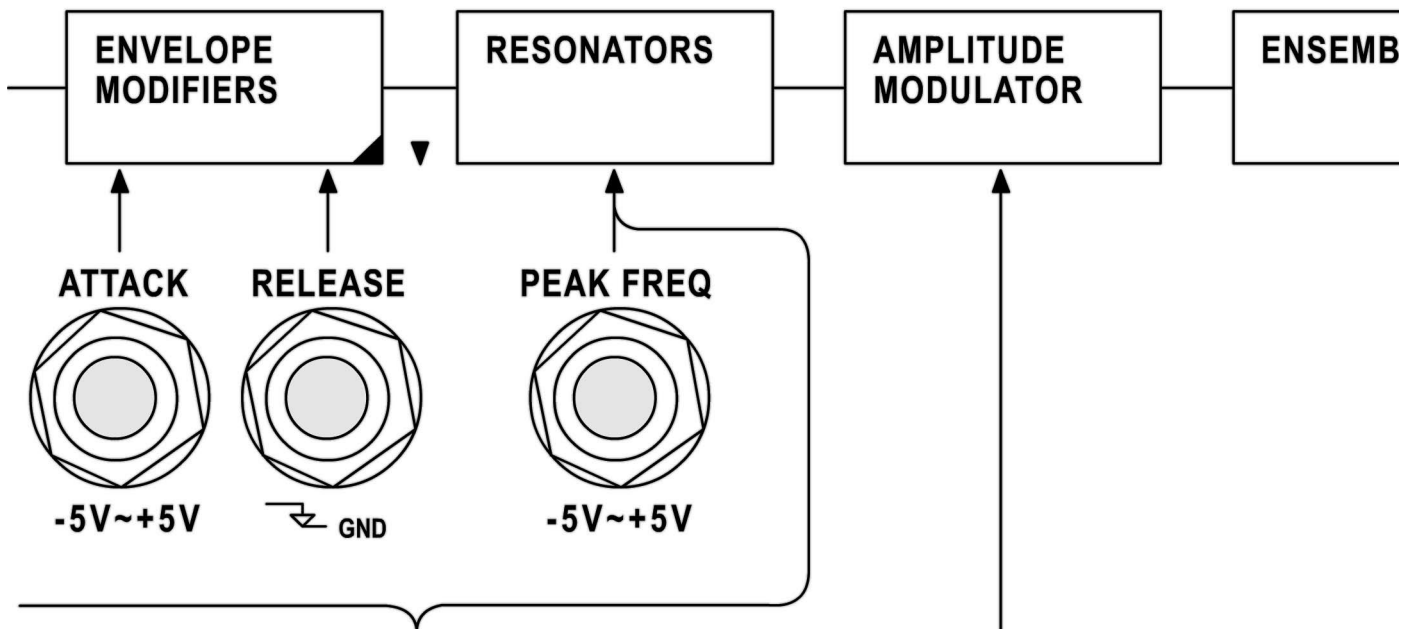


KORG PS-3100

User Manual



KORG • POLYPHONIC SYNTHESIZER PS-3100

取扱説明書 / OWNER'S MANUAL

INDEX

INTRODUCTION

PS-3100 FEATURES AND FACILITIES

Front and back panel illustration

- 1) Temperament Adjust
- 2) Signal Generators (SG)
- 3) Dynamic LP Filters (DLPF)
- 4) Envelope Modifiers (EM)
- 5) Resonators (RESO)
- 6) Total Signal Modifiers
- 7) Sample & Hold
- 8) Modulation Generators (MG1, MG2)
- 9) General Envelope Generator (GEG)
- 10) Voltage Processors (VP)
- 11) Patching Panel
- 12) Volume
- 13) Power
- 14) Manual Controller
- 15) Keyboard
- 16) Rear Panel

SIGNAL FLOW

NORMAL SETTING

(1) CONTROL SECTION: Operation and principles

1-1 Signal Generators

1-2 Dynamic Lowpass Filters

1-3 Envelope Modifiers

1-4 Resonators

(1) CONTROL SECTION: Operation and principles

1-14 VOLTAGE PROCESSORS

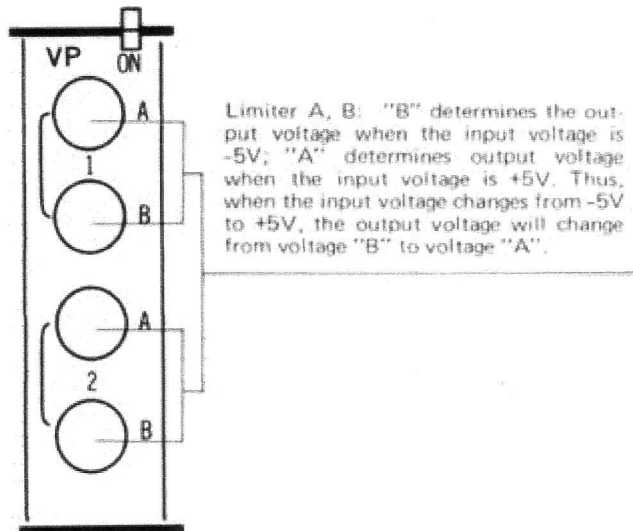
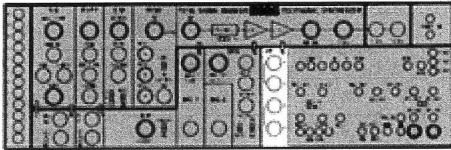


Figure 26 - Voltage Processors

1-14 VOLTAGE PROCESSORS (VP)

When using the output of the control wheel (or some other device) to control a specific circuit, the voltage processors are used to establish the control voltage which will be applied (within the range of the control wheel's output voltage).

Turn on the VCA2 switch and leave other controls at the normal setting.

Set Limiter (1) A to "5" and (1) B to "0" and then turn the Control Wheel back and forth. When a note is played, the volume of the sound will be determined by the position of the Control Wheel. In order to set the lowest volume level to be produced, turn the Control Wheel all the way towards yourself and then turn knob A counterclockwise until the desired level is obtained. These controls allow you to freely establish what sort of control voltages will be produced with an external -5V - +5V input signal. As you may have noticed, you can actually reverse the effect of the Control Wheel on volume changes merely by reversing the A and B knob settings.

4-4 The Effect Of Using Two PS-3100'S

•PS-3300

(5) TROUBLE SHOOTING

(6) SETTING CHARTS

(7) SPECIFICATIONS

1) INTRODUCTION

First of all we would like to thank you for choosing the KORG PS-3100 Polyphonic Synthesizer.

In developing this polyphonic synthesizer we have built on the technical know-how employed in other KORG synthesizers (the Mini KORG for example) and have created a true polyphonic synthesizer that is the realization of many a synthesist's dream. In the past even the larger synthesizers employing multiple VCO's have been monophonic instruments as far as the keyboard was concerned. This fact alone gave them a unique place among keyboard instruments.

In order to create harmony (one of the three basic elements of music) with such a synthesizer, it was necessary to make a multi-track tape recording. By the same token, such instruments are necessarily limited for purposes of live performance. Through the employment of integrated circuit technology, KORG has built in a separate synthesizer for each key on the keyboard thus creating the world's first true polyphonic synthesizer.

Of course this Synthesizer still retains all the advantages inherent in the monophonic models of the past. And there will probably remain an established place for such instruments in the future.

Although the synthesizer is already known for it's wide range of capabilities, the KORG PS-3100 opens up whole new areas of musical exploration and creativity making it a truly epoch making instrument.

PS-3100 FEATURES AND FACILITIES

(1) CONTROL SECTION: Operation and principles

(2) THE SYNTHESIS OF SOUNDS

(3) CAUTION

(4) OPTIONAL EQUIPMENT

(5) TROUBLE SHOOTING

(6) SETTING CHARTS

(7) SPECIFICATIONS

| ^ | PS owner's manual menu |

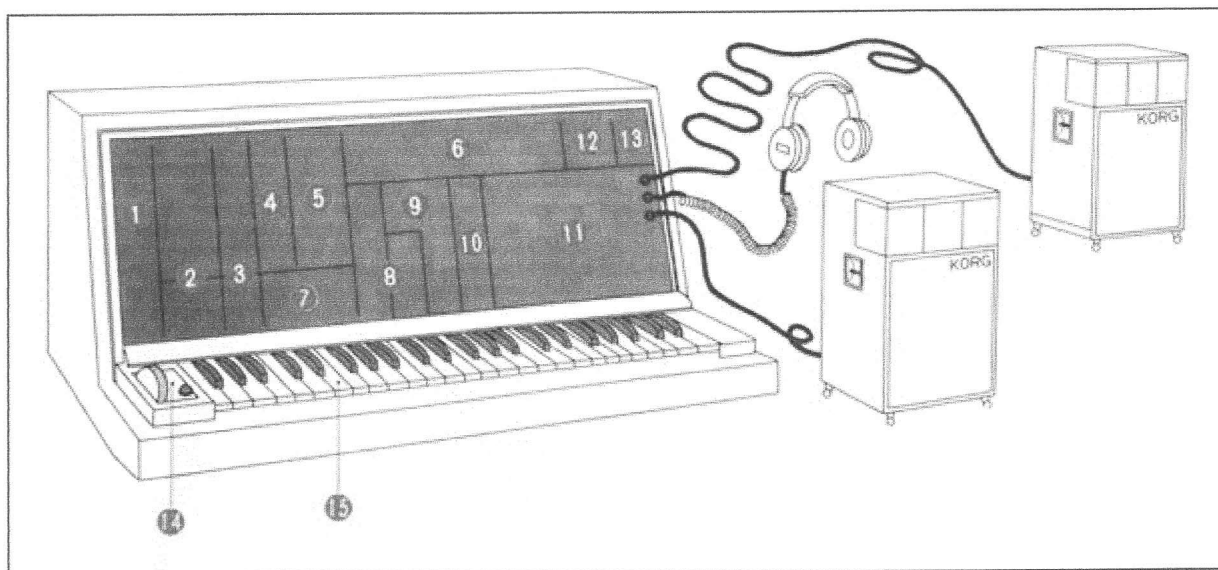
KORG • POLYPHONIC SYNTHESIZER PS-3100

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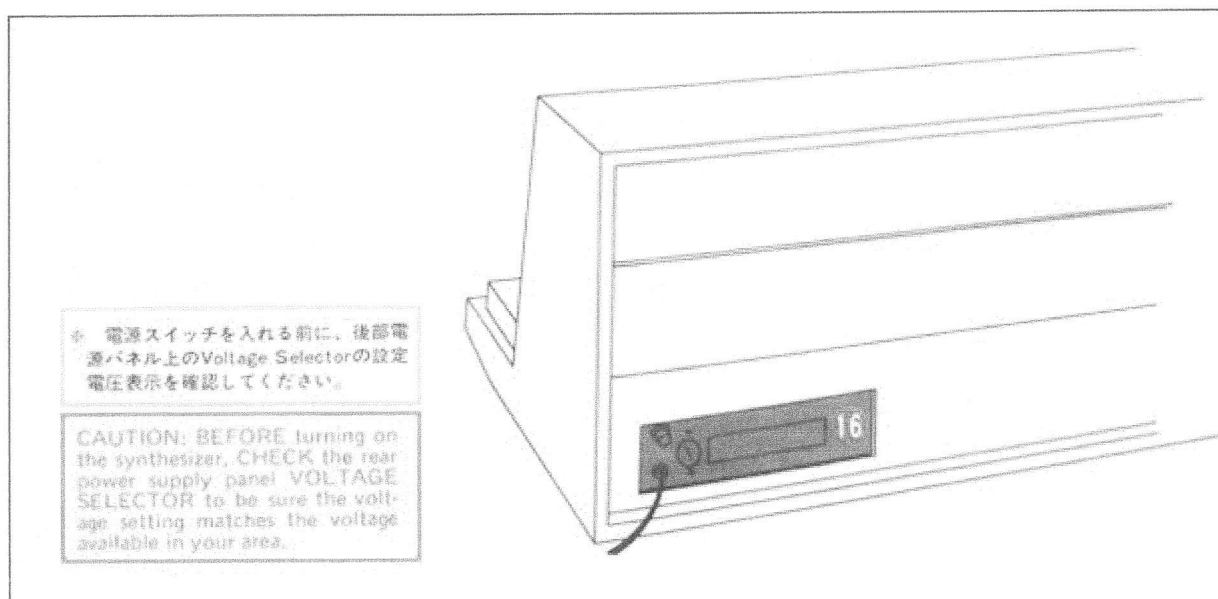
PS-3100 FEATURES AND FACILITIES

Front panel illustration

(circled numbers refer to the description of modules)



Back panel illustration



KORG • POLYPHONIC SYNTHESIZER PS-3100

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PS-3100 - Signal Flow

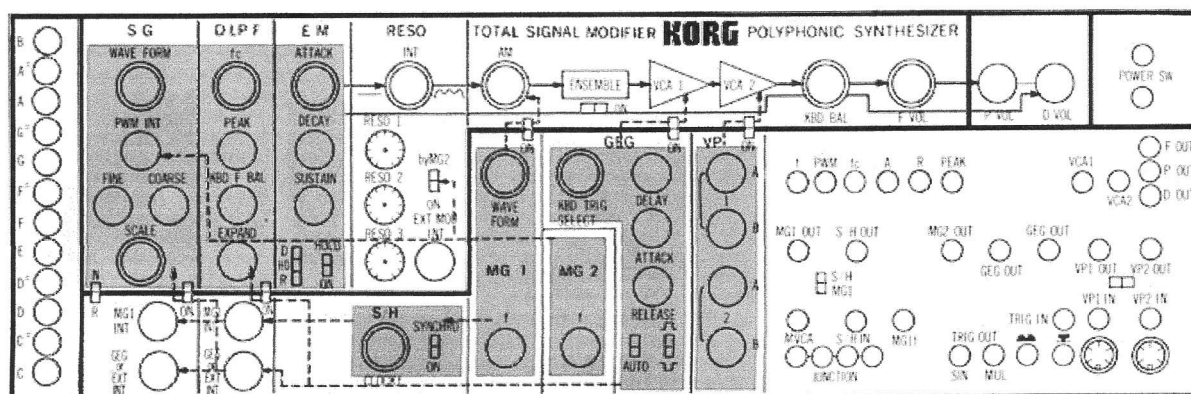


Figure 1 - Signal Flow

CAUTION: BEFORE turning on the synthesizer, CHECK the rear power supply panel VOLTAGE SELECTOR to be sure the voltage setting matches the voltage available in your area.

- Signal Flow

In fig. 1, the solid lines are the sound signal while the broken lines are the control signal (voltage). Note also that there are actually two sound signal routes: one going to final out (F OUT), the other going to direct out (D OUT).

Since the following explanations are based on the flow chart in figure 1, please refer to the chart while reading and try to tie the two together.

NORMAL SETTING

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PS-3100 - The Normal Setting

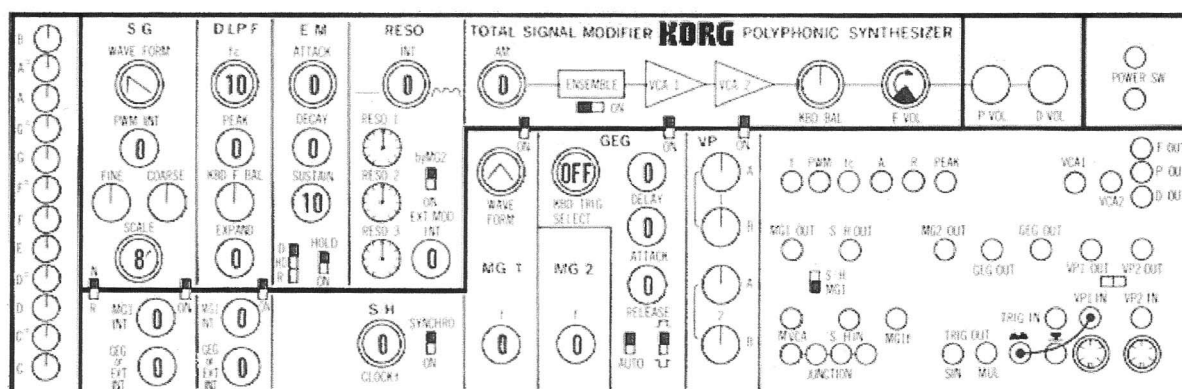


Figure 2 - The Normal Setting

Fig. 2 shows the positions of all controls and switches for a normal setting.

With this setting, all modulation functions are disconnected to produce a basic organ tone.

After completing the normal setting, turn the amplifier volume all the way down and connect a patch cord from the Final Out Jack (F OUT) in the upper right hand corner of the panel to the amplifier's input jack. Then set the Final Volume Knob to "5".

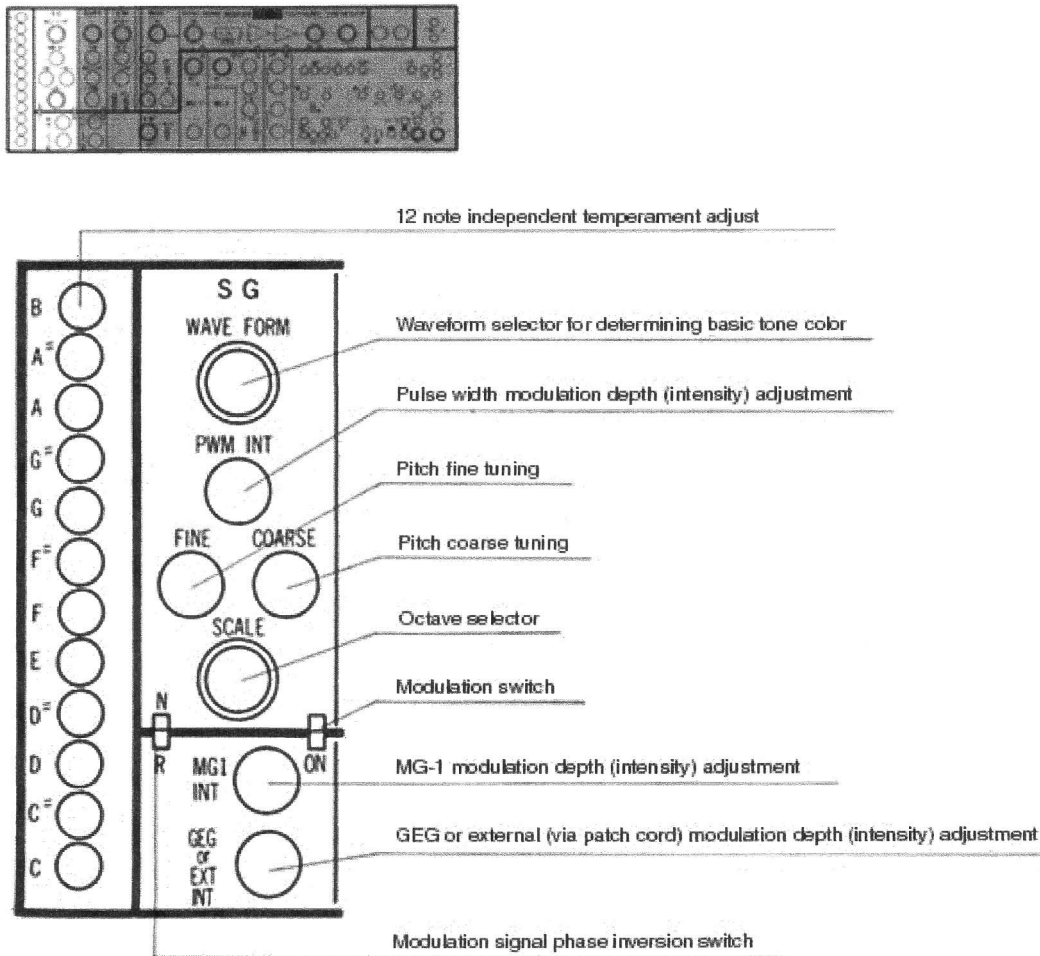
Now, once you have made sure the rear panel power supply VOLTAGE SELECTOR is in the correct position, you are ready to turn on the power. With the power on, play a note or two on the keyboard and turn up the amplifier volume to an appropriate listening level.

If you are using stereo headphones, plug them into the PHONES jack and adjust the volume with the PHONE VOLUME knob. If you don't get an ordinary organ tone, check fig. 2 again to make sure all the settings are correct. This so called normal setting is the base upon which you will build in creating sounds. It is therefore a good idea to memorize the normal setting so that you can return the controls to their original positions whenever necessary. You will discover that this ability is a great help and convenience when working with the synthesizer.

SIGNAL FLOW

(1) CONTROL SECTION: Operation and principles

1 - 1 SIGNAL GENERATOR SECTION (SG)



This part of the synthesizer is the Voltage Controlled Oscillator or VCO for short. All pitch related elements of the sound are controlled by this section.

While playing a key near the middle of the keyboard, try rotating each of the knobs one at a time from top to bottom to see what kind of effect they have on the sound.

In this case, the MG 1 INT (Modulation Generator 1 Intensity Control) and FXT INT knobs will only operate if you turn on the modulation switch.

Finally, set the Fine and Coarse tuning knobs to "0" and set all the small Temperament Adjust knobs at the far left precisely to the center "0" position. The PS-3100 is now tuned for a well-tempered scale.

- VCO (Voltage Controlled Oscillator)

VCO's include antilog amps, VCO's and waveform generators. It is the VCO that is the basis of the music synthesizer's capabilities.

In the case of the PS-3100, the VCO functions as a fixed oscillator when the signal is not frequency modulated. But in order to make possible large pitch bends, vibrato

and other effects during a performance, the configuration of the VC0 is the same as that of ordinary monophonic synthesizers.

Some Scales Other Than The Well-Tempered Scale

	C	C [♯]	D	D [♯]	E	F	F [♯]	G	G [♯]	A	A [♯]	B
	C	Cis	D	Es	E	F	Fis	G	Gis	A	B	H
Ex.1	0	-24	-7	+10	-14	+3	-21	-3	-27	-10	+7	-17
Ex.2	0	/	+4	/	-14	-2	/	+2	/	-16	/	-12
Ex.3	0	/	-28.58	/	-57.15	+14.28	/	-14.29	/	-42.86	/	-71.43

fig. 4

(IN CENTS)

Ex. 1 Mean Tone System. This is a scale used for medieval keyboard instruments. It features a pure major third.

Ex. 2 Just Intonation. A theoretical scale with a pure major third and fifth in C.

Ex. 3 Hepatonal Scale. This scale divides one octave into 7 equal intervals.

* For fine tuning we suggest using the KORG TUNING STANDARD.

(1) CONTROL SECTION: Operation and principles

1-2 Dynamic Lowpass Filters (D LPF)

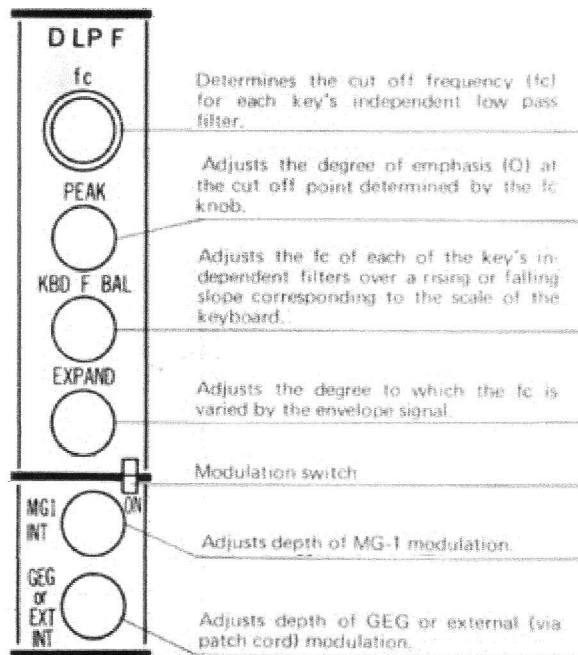
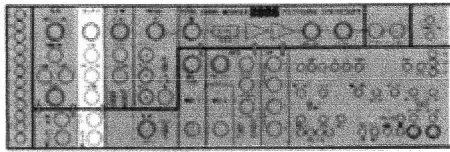


Figure 5 - Dynamic Low Pass Filters

This section of the synthesizer consists of a VCF (Voltage Controlled Filter). It has the function of adding tone color (timbre) to the waveform determined at the SG section (VCO).

With the controls at the normal setting, play a key around the center of the keyboard and gradually turn the fc knob counterclockwise. Note how the sound becomes increasingly rounded in quality. Now turn the peak knob up to "10" and try turning the fc knob. Note how suddenly the tone color changes.

With fc at "10", Peak at "10", and KBD Filter Balance all the way counterclockwise, play the lowest key on the keyboard, a center key, and the highest key. Then vary the fc setting and note how the filters affect the different keys to varying degrees.

Next, turn the KBD Filter Balance all the way up and try the same experiment once more. Note the difference in the effect of the filters on the various keys. The Expand knob controls the degree to which the fc position will vary in proportion to the envelope signal formed by the EM section (to the right).

Try using the Expand knob after you have fully understood the operation of the EM section.

- VCF (Voltage Controlled Filter)

Once the basic waveform has been determined by the VCO and you wish to create a particular quality of sound by means of adjusting the tone color (timbre), a major point to remember is that the tone color may be varied over time. The WF is a type of filter that allows such changes in f_c to take place automatically in proportion to input voltage.

(1) CONTROL SECTION: Operation and principles

1 - 3 Envelope Modifiers (EM)

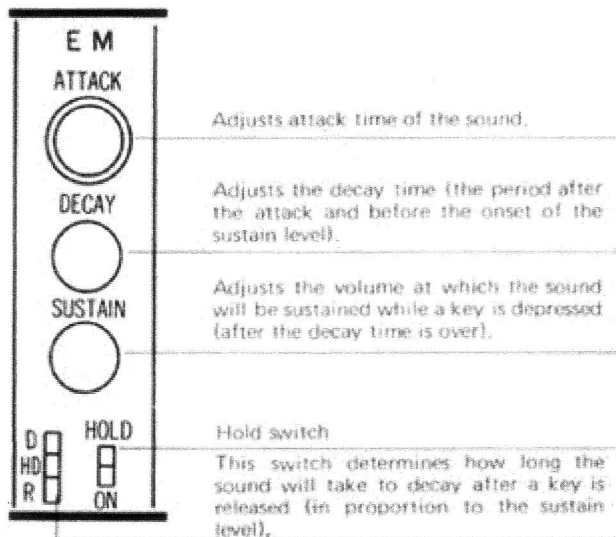
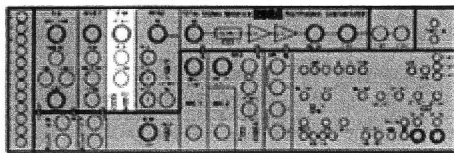


Figure 6 - Envelope Modifiers

1-3 ENVELOPE MODIFIERS (EM)

This section establishes the changes in volume over time when a key is pressed and released.

With all controls at the normal setting, slowly turn the Attack knob clockwise while playing a note on the keyboard. Note the change the attack time (or rise time) of the sound. Now set the Attack, Sustain, and Decay knobs all to the "0" position, then play a key and notice how quickly the sound is cut off. Next, try gradually turning up the decay time and note how the sound takes longer and longer to fall in volume. With Attack at "0" and Decay at "0", turn up the Sustain level a little at a time. Note how this increases the volume that is sustained after the sudden decay time. A switch used to select the length of the final release time of the sound once the key is released. To understand what effect this has, set Attack at "0", Decay at "10", and Sustain at "10". Then play a note and change switch positions.

Last but not least we come to the Hold switch. When this switch is ON, all EM controls with the exception of the Attack knob are disconnected (the settings will have no effect on the sound). Turn the Attack time up to "10" and turn on the Hold switch. Then press a number of keys one after the other leaving a small space between

each. After a few seconds the sound of those keys will become audible one at a time in the same order in which you just played them. When you wish to use the Hold switch, always keep in mind that it will have no effect if the Attack level is below "7".

In order to release the Hold function, the Attack level must be turned down to below "3" at the same time the Hold switch is turned off. Repeat this operation a number of times so that it comes naturally.

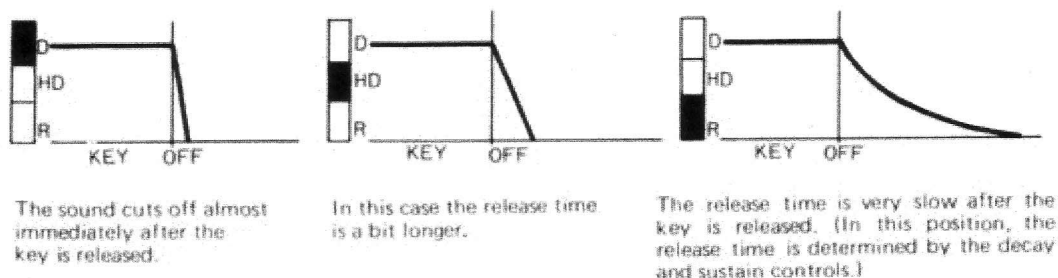


Figure 7 - Release time settings

* With the Hold switch ON (and the attack time above "7"), if you press the same key a second time, it acts to release the hold effect for that note. (Don't confuse this action with a malfunction of the synthesizer.)

• ENVELOPE GENERATOR

The envelope generator is a device that generates a DC voltage signal that varies in strength in accordance with the settings of the Attack, Decay, Sustain, and Release controls when a key is played.

Since this output signal controls the VCA (Voltage Controlled Amplifier), the result is a signal that varies in volume over time. When the same envelope generator output voltage signal is used to vary the cut off frequency of the VCF, the result is called the Expand effect and its intensity is controlled by the D LPF section Expand knob.

Since there is actually one EG and VCA built into the PS-3100 for each and every key in the keyboard, you can obtain the desired output signal as determined by the EG settings even when playing a number of keys in succession.

By the same token, there is a separate VCF for each key thus permitting the use of the Expand effect when and where desired.

(1) CONTROL SECTION: Operation and principles

1 - 4 RESONATORS (RESO)

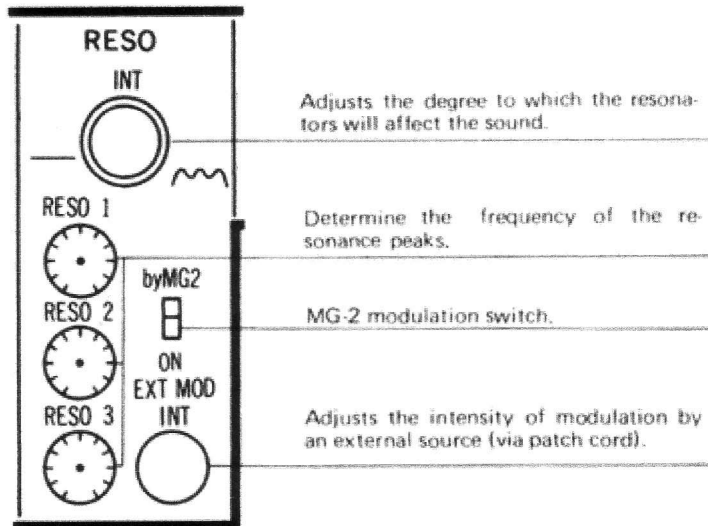
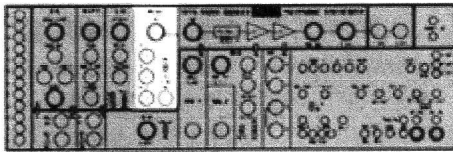


Figure 8 - Resonators

1-4 RESONATORS

Each of the three resonators may be set to resonate at a peak anywhere from 100Hz to 10KHz. With these special filters you can manipulate to a large degree the timbre of the sound produced by the PS-3100. Fig. 9 shows an example of how the peaks may be set for three points: low range, midrange, and high range. Try varying the positions of each of the Resonator knobs and notice the changes in tone color that take place.

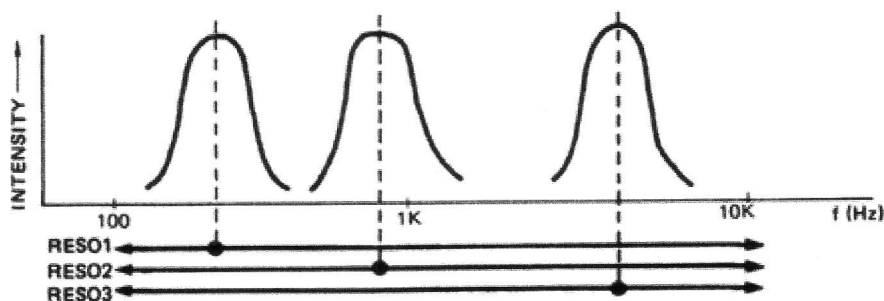


Figure 9 - triple resonator peak frequencies

(1) CONTROL SECTION: Operation and principles

1 - 5 Amplitude Modulator (AM)

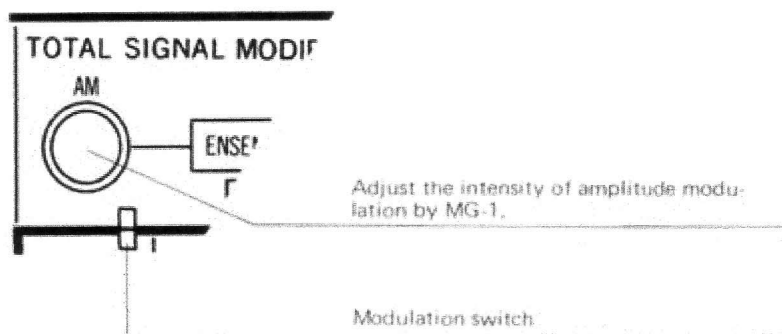
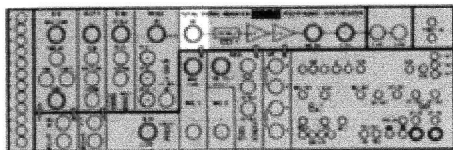


Figure 10 - Amplitude Modulator

• AMPLITUDE MODULATION

Amplitude modulation is a method of varying the amplitude of one AC signal in proportion to the fluctuations in a second signal. The tremolo effect of most electronic instruments is obtained by modulating the sound signal with a second low frequency signal by means of a VCA.

When the AM knob is set to "5", modulation is 100% and the result is a tremolo effect. If you turn the AM knob up to "10", modulation is 200% giving the same effect as a ring modulator. The availability of both these effects gives you additional freedom in sound synthesis.

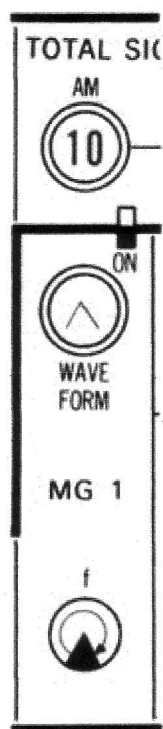


Figure 11 - Using the AM effect

- Using the AM effect with the PS-3100

Set the AM knob to "10", turn on the switch below the knob, set the MG-1 waveform for TRI (triangle), and the Frequency knob to "0". (All other controls should be at normal setting.) Then play a key and slowly turn up the Frequency knob to "10". Note how the sound changes first into a tremolo-like effect and then into a metallic sound with the ring modulator effect. (Try using different waveforms both in the singal generator section and in MC-1. Note the differences in tone color and effect.)

(1) CONTROL SECTION: Operation and principles

1-6 Ensemble

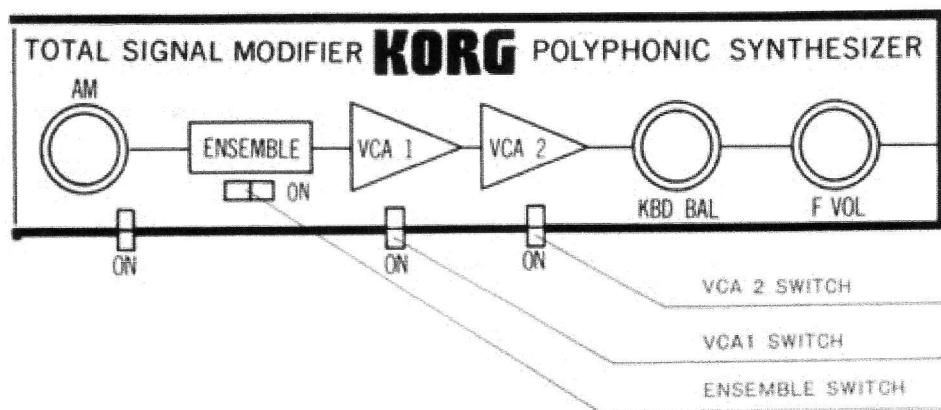
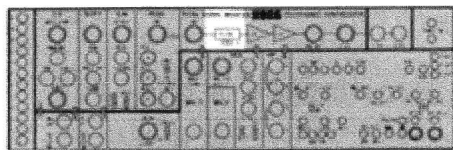


Figure 12 - Ensemble

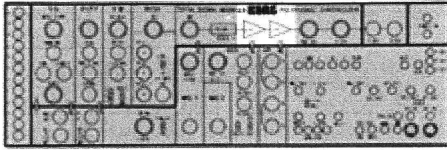
• 1-6 ENSEMBLE

The Ensemble switch is used to add an ensemble effect to the sound. This effect is not obtained from extra sound sources; the number of sound sources in the PS-3100 is limited to the number of keys. These in turn are part of a single coherent system. The Ensemble switch is handy when you want an extra richness in the music that is not sufficiently provided by such features as pulse width modulation.

With all other controls at the normal setting, turn the attack time up to "5" and play a chord. Then hear the difference in tone color when you turn on the Ensemble switch.

(1) CONTROL SECTION: Operation and principles ^

1-7 TOTAL VCA



- Total VCA

This device varies the total sound volume over time. Its operation is linked to that of other parts of the synthesizer described below.

- VCA-1 Switch

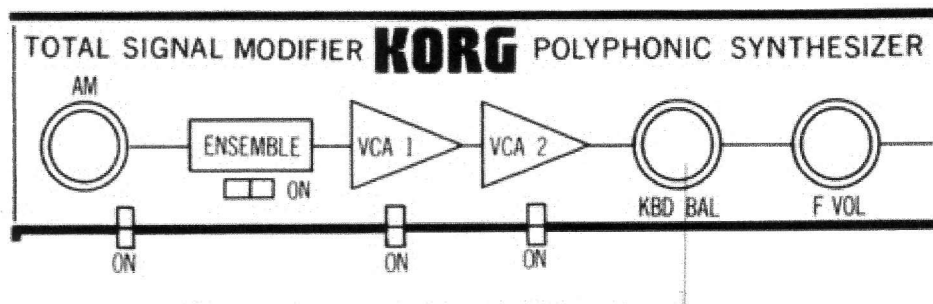
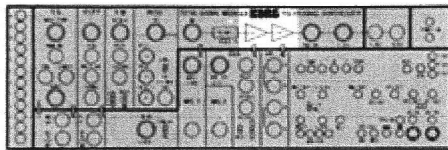
When this switch is on, the VCA-1 (Voltage Controlled Amplifier) changes the volume of the sound over time in accordance with the GEG settings.

- VCA-2 Switch

This switch is turned on when you want to use an external control such as the control wheel or control pedal to vary the volume of the sound via the voltage processors.

(1) CONTROL SECTION: Operation and principles

1-8 KEYBOARD VOLUME BALANCE



By turning this knob clockwise (toward "+") the volume of the keys above the middle of the keyboard is emphasized while that of those below the middle is attenuated. By turning toward "-", the opposite effect is obtained.

Figure 13 - Keyboard Volume Balance

•KEYBOARD VOLUME BALANCE (KBD BAL)

This control is another unusual feature of the PS-3100. Although the knob is ordinarily set to the "0" position, its main use is to correct volume imbalances that may be caused by other sections of the synthesizer such as the KBD Filter Balance control of the D LPF section.

With all controls at the normal setting and the Keyboard Balance knob at "0", play a chord at the bottom, middle, and top of the keyboard and listen to the volume. Next try doing the same thing with the knob at "+5" and again at "-5". Note the differences in volume at different points on the keyboard.

When other units are connected to the PS-3100, the Keyboard Volume Balance and Filter balance of all units may be controlled at the same time by using the controls on the PS-3100.

(1) CONTROL SECTION: Operation and principles

MODULATION GENERATOR 1 (MG-1)

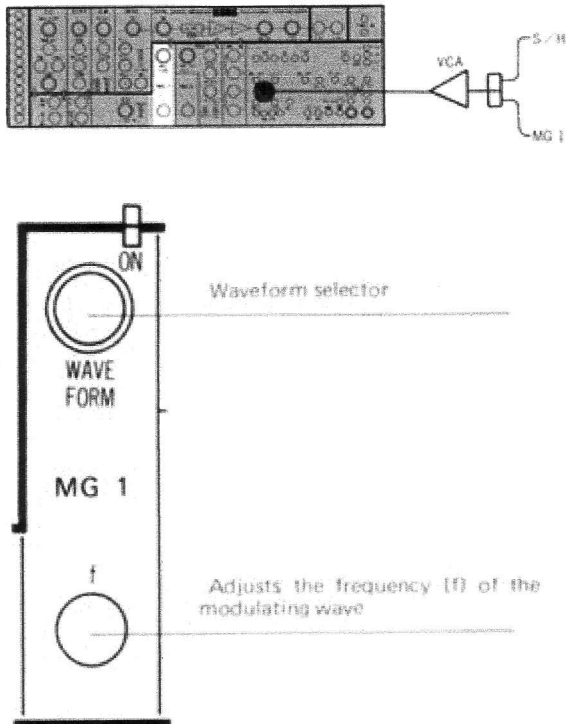


Figure 14 - Modulation Generator

•MODULATION GENERATOR

Until now, synthesizers employed an LF0 (low frequency oscillator) which generated a modulating signal that was variable between 0.1Hz and 10Hz. However, in order to broaden the range of available frequencies, the PS-3100 is able to generate signals from below 0.1Hz to above 1kHz.

Using the Modulation Generator

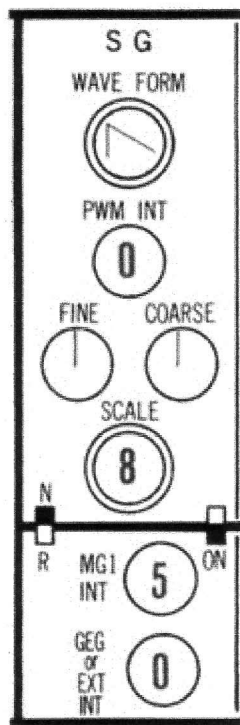


Figure 15 - MG1 and the SG module

(1) With the Signal Generator section set as shown in fig. 15, vary the waveform and frequency of MGA and listen to the different effects. (in the case of pink noise and white noise, the position of the Frequency Knob will not change the effect.) The easiest way of experimenting with this effect is to first turn off the Hold switch and then play a single key.

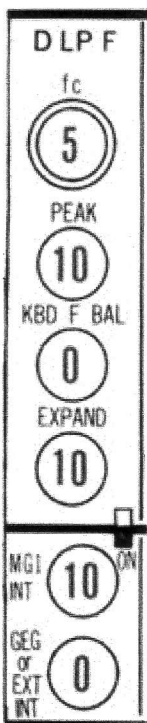
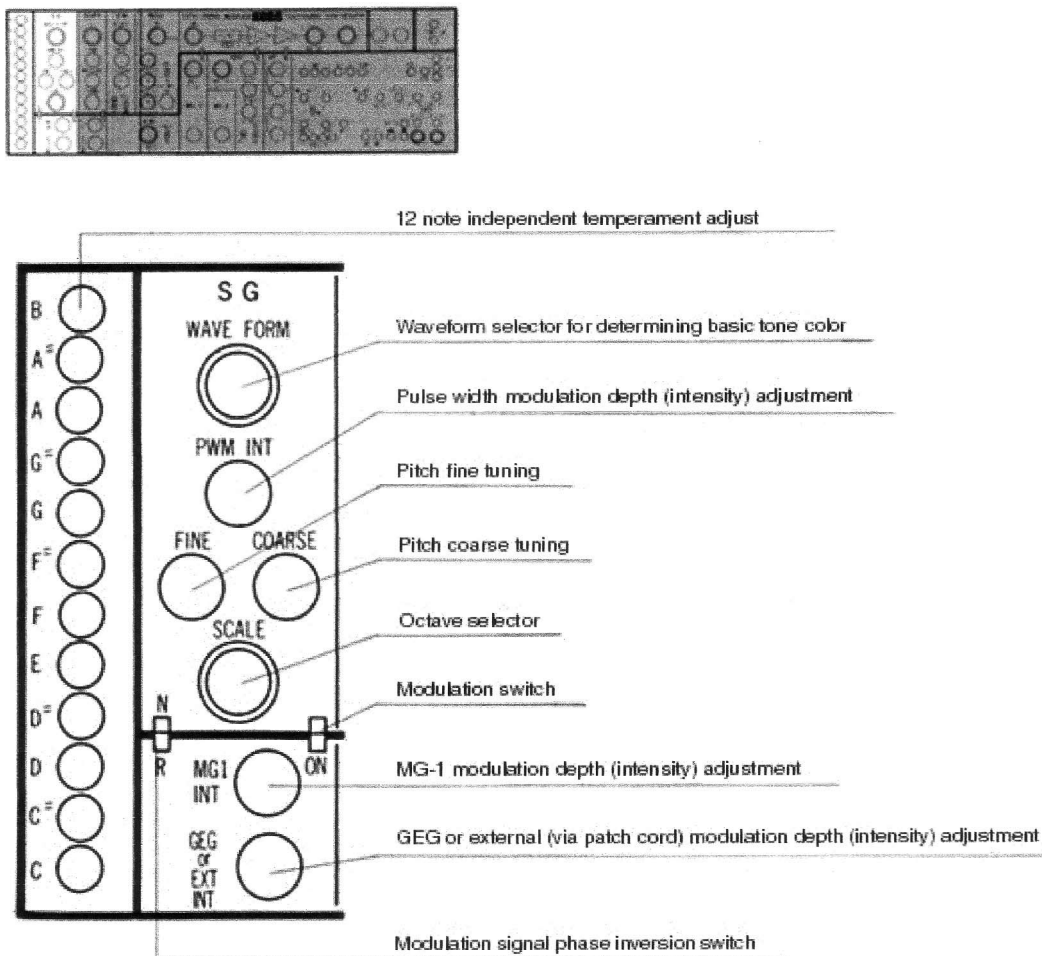


Figure 16 - MG1 and the DLPF module

(2) Set the D L P F section as shown in figure 16 and then go through the same procedure as above. Note how in this case the waveform of MCA and the operation of the filters are related. (The Signal Generator controls should be at the normal setting.)

(1) CONTROL SECTION: Operation and principles

1 - 1 SIGNAL GENERATOR SECTION (SG)



This part of the synthesizer is the Voltage Controlled Oscillator or VCO for short. All pitch related elements of the sound are controlled by this section.

While playing a key near the middle of the keyboard, try rotating each of the knobs one at a time from top to bottom to see what kind of effect they have on the sound.

In this case, the MG 1 INT (Modulation Generator 1 Intensity Control) and FXT INT knobs will only operate if you turn on the modulation switch.

Finally, set the Fine and Coarse tuning knobs to "0" and set all the small Temperament Adjust knobs at the far left precisely to the center "0" position. The PS-3100 is now tuned for a well-tempered scale.

- VCO (Voltage Controlled Oscillator)

VCO's include antilog amps, VCO's and waveform generators. It is the VCO that is the basis of the music synthesizer's capabilities.

In the case of the PS-3100, the VCO functions as a fixed oscillator when the signal is not frequency modulated. But in order to make possible large pitch bends, vibrato

and other effects during a performance, the configuration of the VC0 is the same as that of ordinary monophonic synthesizers.

Some Scales Other Than The Well-Tempered Scale

	C	C [#]	D	D [#]	E	F	F [#]	G	G [#]	A	A [#]	B
	C	Cis	D	Es	E	F	Fis	G	Gis	A	B	H
Ex.1	0	-24	-7	+10	-14	+3	-21	-3	-27	-10	+7	-17
Ex.2	0	/	+4	/	-14	-2	/	+2	/	-16	/	-12
Ex.3	0	/	-28.58	/	-57.15	+14.28	/	-14.29	/	-42.86	/	-71.43

fig. 4

(IN CENTS)

Ex. 1 Mean Tone System. This is a scale used for medieval keyboard instruments. It features a pure major third.

Ex. 2 Just Intonation. A theoretical scale with a pure major third and fifth in C.

Ex. 3 Hepatonic Scale. This scale divides one octave into 7 equal intervals.

* For fine tuning we suggest using the KORG TUNING STANDARD.

(1) CONTROL SECTION: Operation and principles

1-11 MODULATION VCA (MVCA)

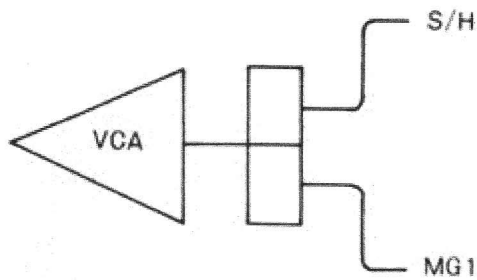
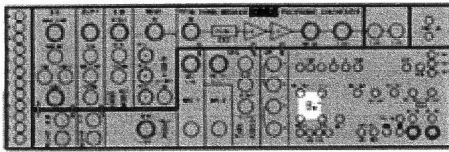


Figure 20 - Modulation VCA

1-11 MODULATION VCA (MVCA)

In contrast to the Total VCA that varies the volume of the total sound produced by the synthesizer, the MVCA uses voltage to control the level of the modulating signal of Modulation Generator 1 and the Sample and Hold circuit. The MVCA is useful for such things as delayed vibrato or when you want to use the control wheel to vary the intensity of modulation. (See 2-4)

(1) CONTROL SECTION: Operation and principles

1-11 MODULATION GENERATOR 2 (MG 2)

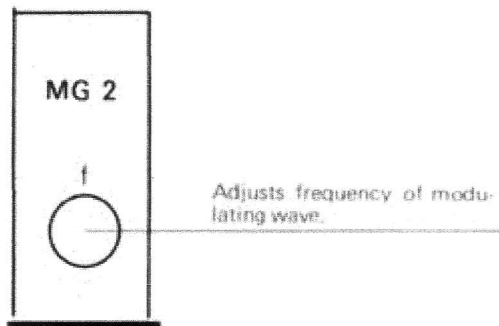
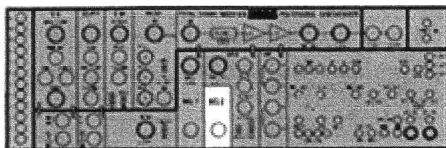


Figure 21 - Modulation Generator 2

1-12 MODULATION GENERATOR 2 (MG-2)

This modulating signal generator is connected to the PWM and Resonator circuits by the internal patch. Its frequency is variable between less than 0.3Hz and more than 10Hz. The output waveform is a triangle wave.

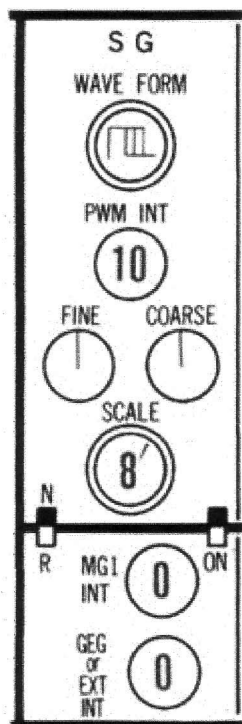


Figure 22 - Modulation Generator 2 in use

With the settings shown in fig. 22, rotate the frequency knob and note the PWM effect.

(1) CONTROL SECTION: Operation and principles

1-13 GENERAL ENVELOPE GENERATOR (GEG)

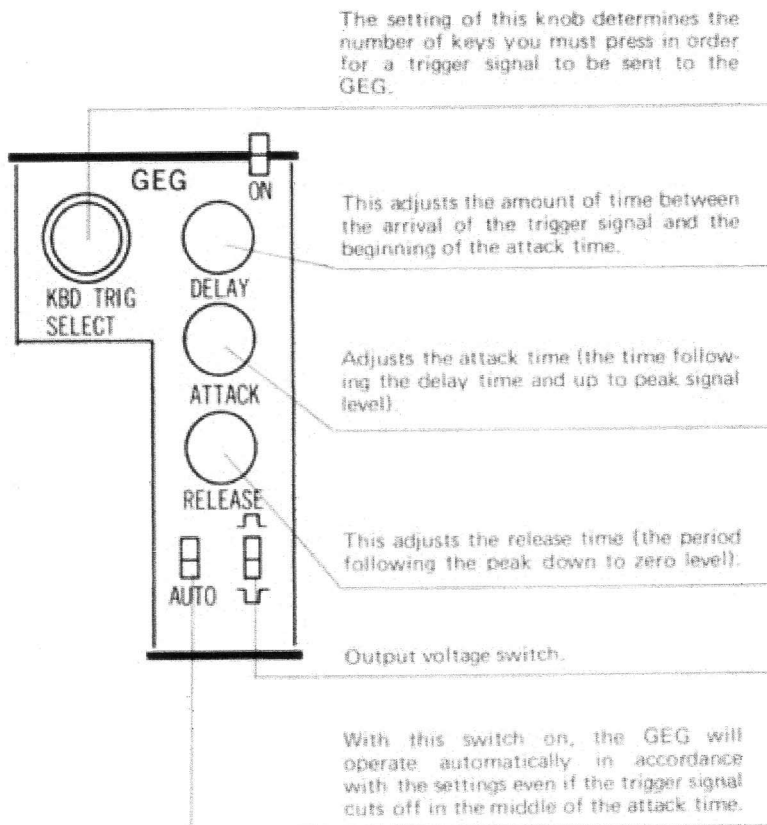
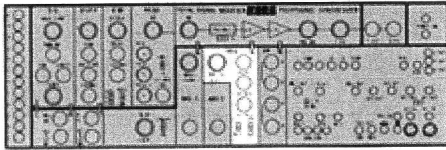


Figure 23 - General Envelope Generator

1-13 GENERAL ENVELOPE GENERATOR (GEG)

As described earlier, the Envelope Modifiers section generates an envelope signal for each of the keys on the keyboard. The GEG, on the other hand, generates a general envelope that controls every section of the PS-3100.

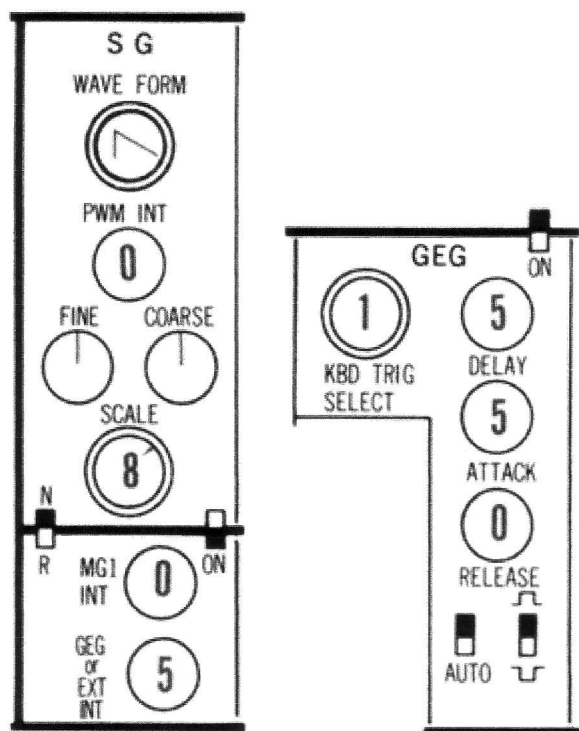


Figure 24 - General Envelope Generator in use

With the settings shown in figure 24, listen to the changes in pitch over time as you play and release a key. Now notice how the timing of the effect varies when you change the Delay and Attack settings.

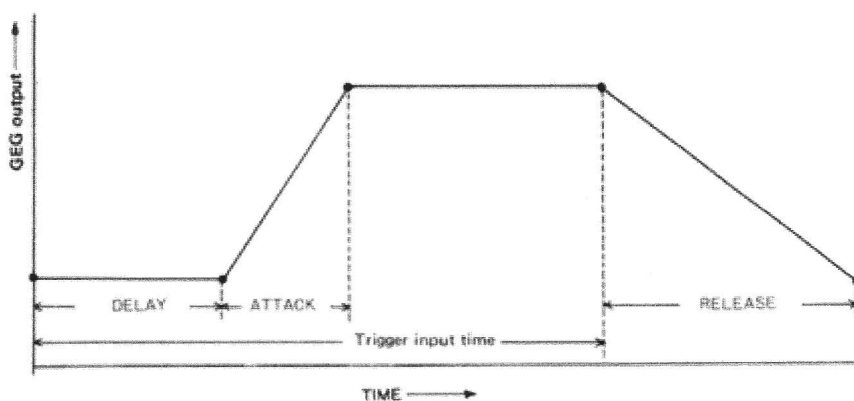


Figure 25 - General Envelope Generator output

Try setting the KBD Trigger Select Knob to "2", "3", "4" and "5" in turn and notice how this allows you to control the beginning of GEG operation dependent upon the number of keys played at once. (In this case, set the GEG controls as shown in figure 25.)

Next, turn on the VCA1 switch (with other controls at the normal setting) and confirm that the GEG controls the envelope of the total sound produced.

NOTE Instead of using the keyboard to generate the trigger signal, it is possible to use the Momentary Switch on the control panel. (This requires a patchcord connection.)

(1) CONTROL SECTION: Operation and principles

1-14 VOLTAGE PROCESSORS

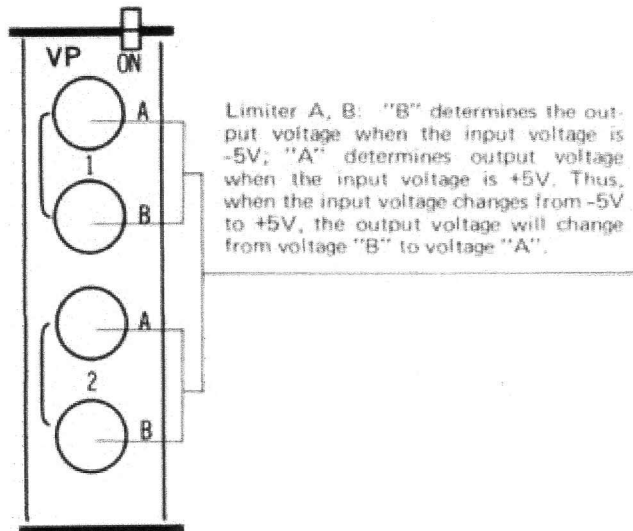
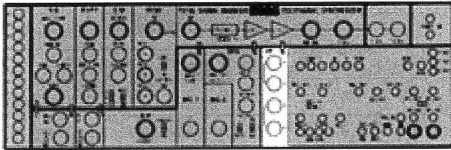


Figure 26 - Voltage Processors

1-14 VOLTAGE PROCESSORS (VP)

When using the output of the control wheel (or some other device) to control a specific circuit, the voltage processors are used to establish the control voltage which will be applied (within the range of the control wheel's output voltage).

Turn on the VCA2 switch and leave other controls at the normal setting.

Set Limiter (1) A to "5" and (1) B to "0" and then turn the Control Wheel back and forth. When a note is played, the volume of the sound will be determined by the position of the Control Wheel. In order to set the lowest volume level to be produced, turn the Control Wheel all the way towards yourself and then turn knob A counterclockwise until the desired level is obtained. These controls allow you to freely establish what sort of control voltages will be produced with an external -5V - +5V input signal. As you may have noticed, you can actually reverse the effect of the Control Wheel on volume changes merely by reversing the A and B knob settings.

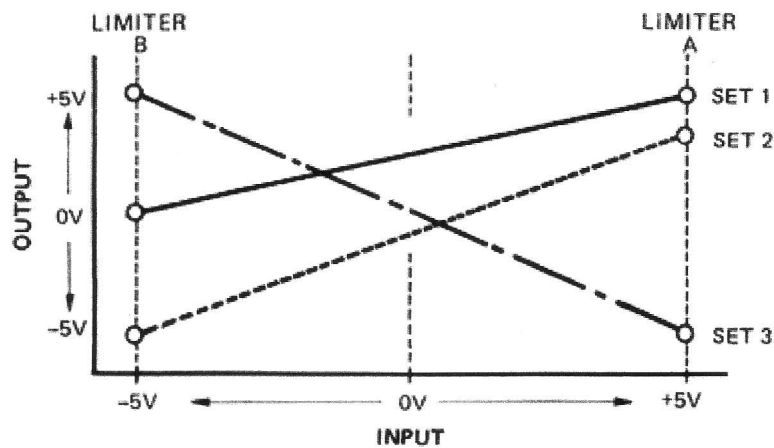


Figure 27 - Voltage Processors voltages

As shown in fig. 27, when an external input voltage is applied to the VP, the VP output voltage will change linearly from the setting of Limiter B to the setting of Limiter A. When external control voltages are not applied to the VP (when no external inputs are connected), the VP acts as a regulated voltage generator. In this case, coarse adjustments of VP output voltage may be made with Limiter B, while fine adjustments may be made with Limiter A. The range of uses for the VP is very wide. Depending upon the settings of the two knobs, the VP may be used as a buffer amp, a phase inverter, or a power supply.

(1) CONTROL SECTION: Operation and principles

1-15 CONTROL WHEEL

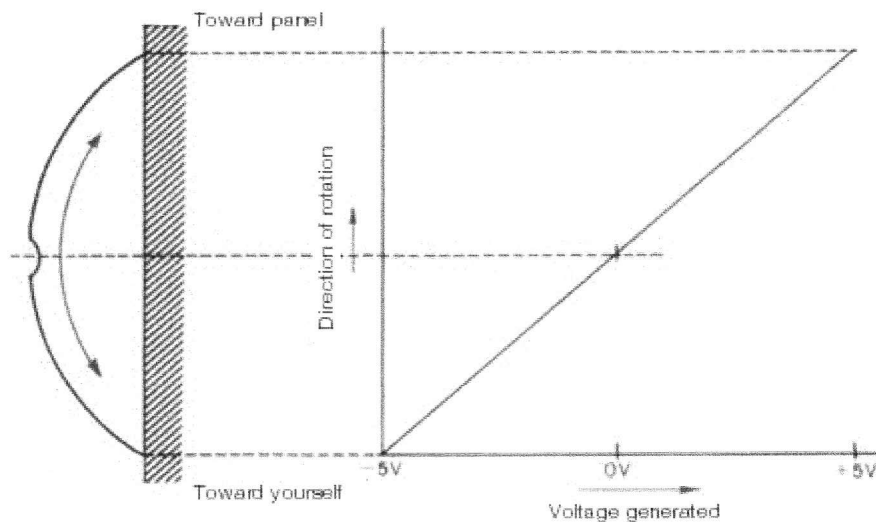


Figure 28 - Control Wheel

1-15 CONTROL WHEEL

Since the PS-3100 is a true polyphonic synthesizer, it has performance capabilities and effects not found elsewhere. Particularly during a live performance, the Control Wheel plays an important role, giving you free control over the effects produced. Depending on the position of the Control Wheel, the output voltage is continuously variable from -5V to +5V.

Since the Control Wheel is not connected by the internal built-in patch, it is necessary to use a patchcord to connect the Control Wheel output to the input you wish to control.

(1) CONTROL SECTION: Operation and principles

1-16 MOMENTARY SWITCH

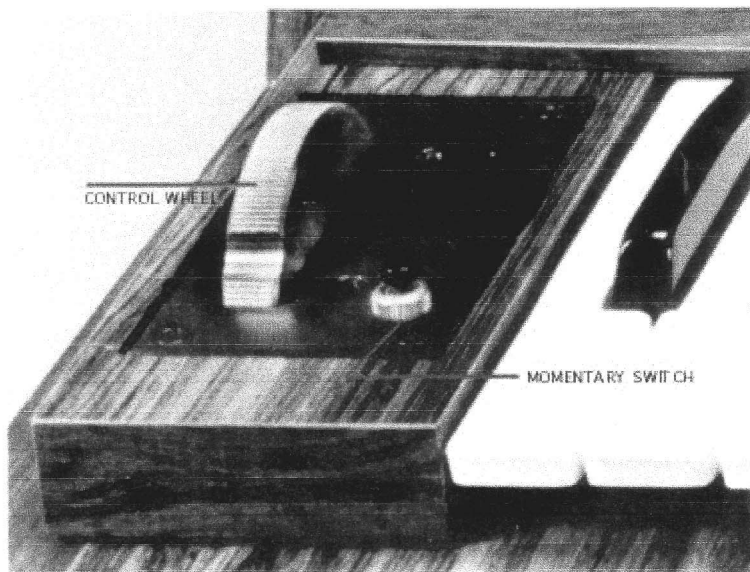


Figure 29 - Momentary Switch and Control Wheel

1-16 MOMENTARY SWITCH

The Momentary Switch is used to manually generate a trigger signal to trigger such functions as the GEG or Release.

(1) CONTROL SECTION: Operation and principles ^

1-17 VOLUME CONTROL

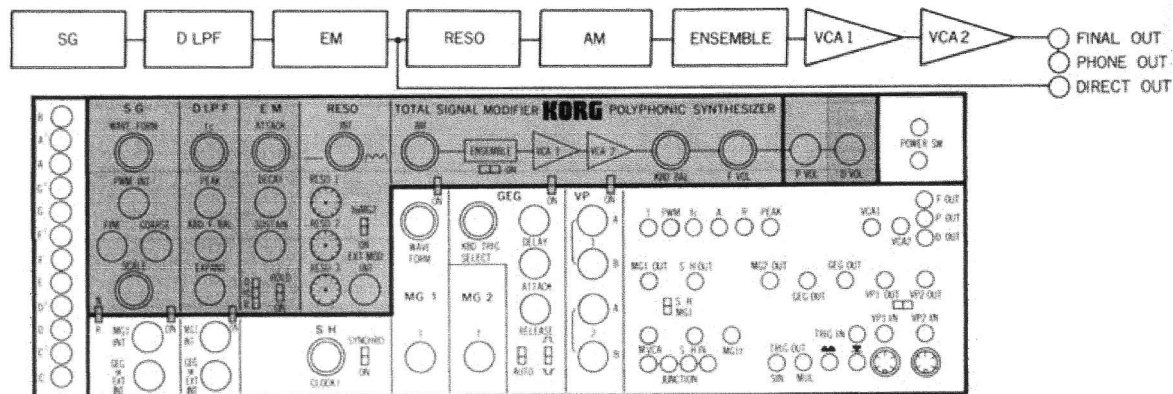


Figure 30 - Volume Control

1-17 VOLUME CONTROL

There are two outputs in the PS-3100: Final Out and Direct Out. In figure 30, the sounds produced within the grey section go to the Direct Out jack. The sounds produced with the addition of effects covered by the hashed out section go to the Final Out jack. When using headphones connected to the Phones jack, the sound heard is that of Final Out. By using two amps and connecting one to each output, you can create sounds which comparing the "basic" direct sound with that having such additional effects as Resonance and Ensemble.

Furthermore, a three dimensional effect may be obtained during a performance by reproducing both channels simultaneously.

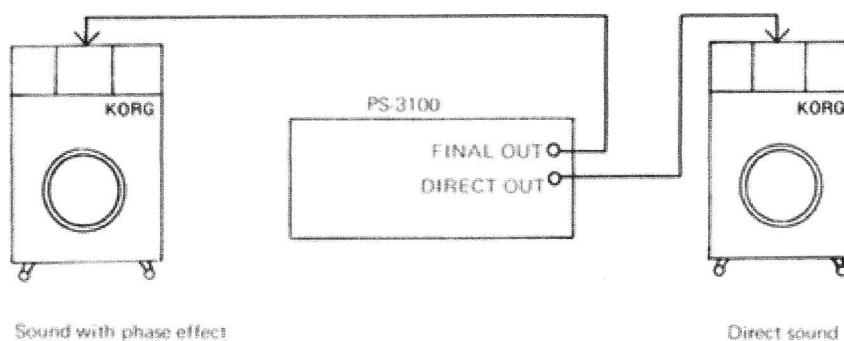


Figure 31 - Using the Direct and Final outputs and two amplifiers

(2). THE SYNTHESIS OF SOUNDS

2 - 4 Understanding The Patch And Its Use

• Why is it necessary to set up a patch?

Since the PS-3100 has a built-in patch many sounds can be created without ever touching a patch cord. However, there are terminals on the panel for the CONTROL WHEEL and MOMENTARY SWITCH but these are not connected to anything. Therefore it is necessary, to think about the best way to connect these terminals and use them in such a way as to improve on the effects already available to you with the built-in patch. If connections are made unthinkingly there is always the danger that the result will be considerably less useful than what was already there. The first and most important thing to do is clearly understand the control voltage chart (-5V+5, 0+5, 5Vp-p etc.) and its relationship to every block diagram.

For example, once you have decided what you are going to control with the control wheel and how (In other words, if you use -5V+5V controlled by the control wheel, what are you actually going to control with this setup?), careful attention must be paid to the rated voltage range of that which is to be controlled.

Even if -5V+5V is applied to something that has a voltage range of 0+5V the control voltage from -5V+0V will have no effect. Furthermore you should understand that if you use an analog voltage of -5V+5V for the purpose of switching a digital input marked \perp GND, anything above +3V will be OFF while voltage below 0V will be ON. Compared to other outputs, that of the control wheel has a relatively high output impedance. Since this may cause malfunctioning if directly connected to a digital input, as a rule it is best to connect the control wheel output to a VP input and then connect the VP output to the digital input.

The procedure to follow when thinking about setting up a patch:

- (1) What kind of effect do you want and where do you want it?
- (2) What type of control signal is needed for that purpose?
- (3) What section of the synthesizer can you use to produce that type of control signal?

You will find that you will rarely achieve the effect you want unless you go through these steps in your thinking process. (This type of thinking is also important when using the built-in patch.)

- (1) You want to use the control wheel to vary the fc and depth of FM modulation of the SG (VCO) via the MG1.
- (2) Make use of the control voltage of the control wheel.
- (3) Control the depth of FM modulation by means of the MVCA. Then apply the control voltage to the external fc input terminal.

Therefore connect the output control voltage from the control wheel to both the MVCA and the fc input terminals. However, since the control wheel has only one output use the JUNCTION section to distribute the signal to the MVCA and fc terminals.

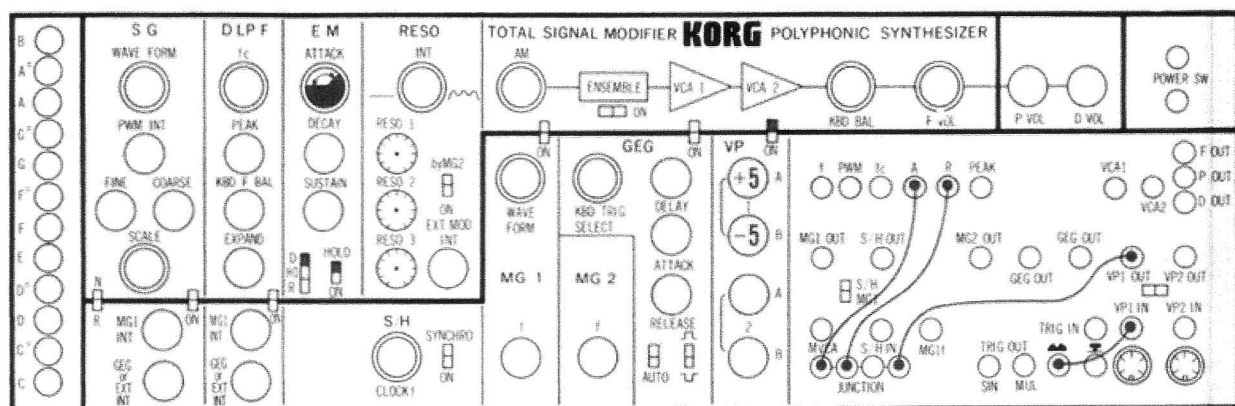


Figure 47 - Using the control wheel to completely change the contour of the envelope

[EXAMPLE] USING THE CONTROL WHEEL TO COMPLETELY CHANGE THE CONTOUR OF THE ENVELOPE (from slow attack and release to a percussive sound).

- (1) You want to apply an external control voltage to the envelope modifiers.
- (2) Make use of the control voltage of the control wheel.
- (3) Set up a patch that will control the ATTACK TIME and switch the RELEASE function ON and OFF.

Therefore all you have to do is use the output voltage of the control wheel to control the attack time and the activation of the release function as follows:

CONTROL WHEEL > VP > JUNCTION
 JUNCTION > ATTACK
 JUNCTION > RELEASE

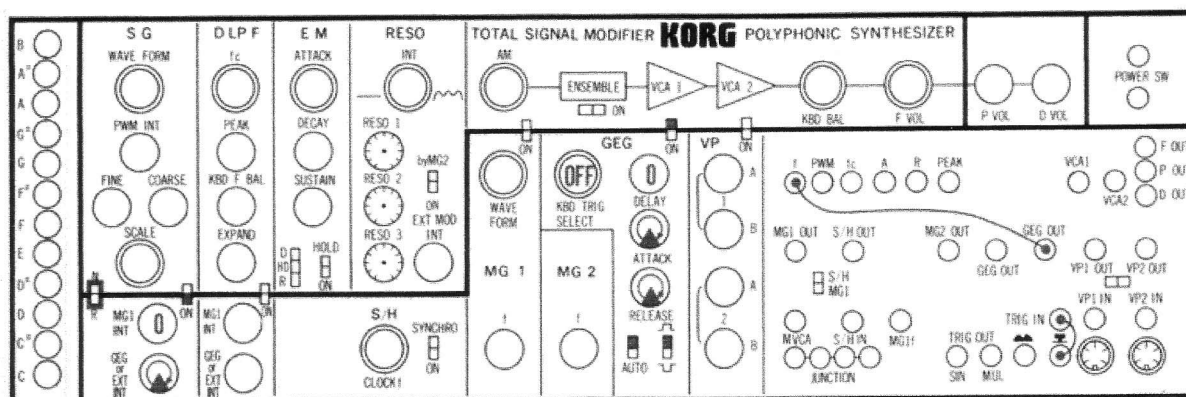


Figure 48 - Using the momentary switch to alter the pitch of a sound by some amount

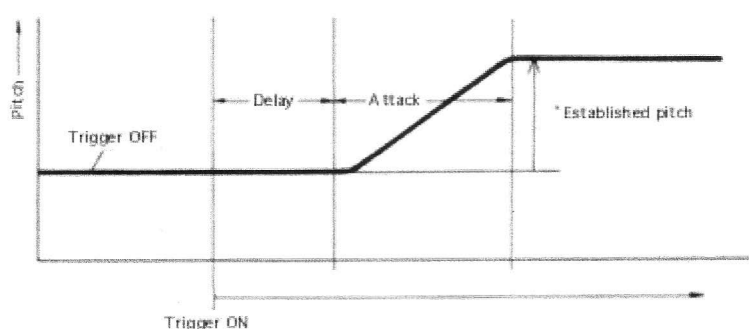


Figure 49- Example of the envelope produced

[EXAMPLE] USING THE MOMENTARY SWITCH TO ALTER THE PITCH OF THE SOUND BY SOME AMOUNT (BY SOME NUMBER OF OCTAVES):

(This is the same whether the change is gradual or abrupt.)

- (1) You want to change the oscillator frequency of the, SG (VCO) by means of a trigger signal produced by the momentary switch.
- (2) Apply the trigger signal to the GEG and obtain the desired envelope.
- (3) Set attacked release times with the GEG.

Therefore, set up the patch as follows:

MOMENTARY SWITCH OUT > GEG TRIG IN
 GEG OUT(□L +5V, 0V) > SG (VCO) FREQ IN

The pitch may then be controlled by the EXT INT knob of the SG.

In this case operation is easiest if the DELAY, ATTACK, and RELEASE functions of the GEG are set at "0". (Switching the momentary switch on and off will determine the pitch difference.)

If you wish to give some time variations to the effect obtained whet the momentary switch is ON, just change the settings of the DELAY, ATTACK, and RELEASE functions of the GEG.

NOTE: By switching the position Of the SG NORMAL <> REVERSE switch you can change the pitch upward or downward at will.

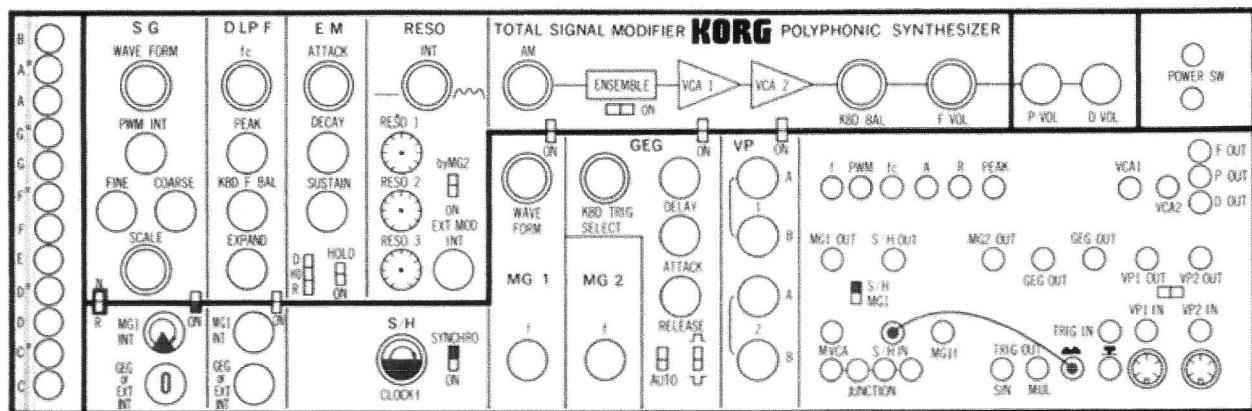


Figure 50 - Obtaining a polyphonic glissando effect

[EXAMPLE] OBTAINING A POLYPHONIC GLISSANDO EFFECT BY MOVING THE CONTROL WHEEL.

- (1) You want to change the oscillator frequency of the SG (VCO) in a series of steps.
- (2) You need a continuously changing voltage signal controlled by the control wheel.
- (3) Connect the control wheel output voltage to the SAMPLE & HOLD input in order to change it into a signal that varies in steps.

Normally (with the built-in patch) MG1 is connected to the sampling signal input of the S/H circuit. But if you connect the control wheel control voltage to the S/H, the pitch will only change (in accordance with changes in the -5V +5V range of the control wheel's output voltage) when the control wheel is moved. The speed of the glissando effect may be varied by changing the CLOCK FREQUENCY of the S/H.

Therefore:

CONTROL WHEEL OUT > S/H IN (by means of a patch cord.) Glissando range is adjusted with the MG1 INT of the SG section. Glissando speed is adjusted with the S/H CLOCK FREQUENCY.

4. OPTIONAL EQUIPMENT - EXPANDING OPERATIONAL CAPABILITY

4-1. ACCESSORIES SUPPLIED WITH THE PS-3100

Patch cords 25cm x 2 35cm x 2

External connection cord with adaptor 3m x 1

4-2. OPTIONAL UNIT:

The following types of equipment are available as optional units for the PS-3100.

•PS-3010	Separate Polyphonic Keyboard	This keyboard section with a wide range of full capability manual controls greatly expands the possibilities of the polyphonic synthesizer. It may be used with the PS-3100 by employing the 60P connector.
•PS-3020	Monophonic Keyboard	The special design of this keyboard allows you to use the polyphonic sound source of the PS-3100 or PS-3300 as a monophonic synthesizer. With such a setup it is possible to produce an extremely rich sound not obtainable with other equipment in the past.
•PS-3030	Digital Sequencer	This PS-series digital sequencer allows chords to be played automatically.
•PS-3040	Universal Foot Controller	This 2-ganged foot pedal was designed especially for use with the PS-3100.
•PS-3050	60P Junction Box	This Junction box is used when you wish to connect more than one external optional unit such as the PS-3300 to the PS-3100 by means of 60P connectors.
•PS-3300	3-System Integrated Multi-Capacity Unit.	
•PS-3001	60P Connector Cord	
•Special Hard Carrying Case		Please be sure to use this protective case when travelling or shipping the synthesizer.

4-3. EXAMPLES OF EXPANDED OPERATIONAL CAPABILITY

Connections for using the PS-3100 as a monophonic synthesizer:

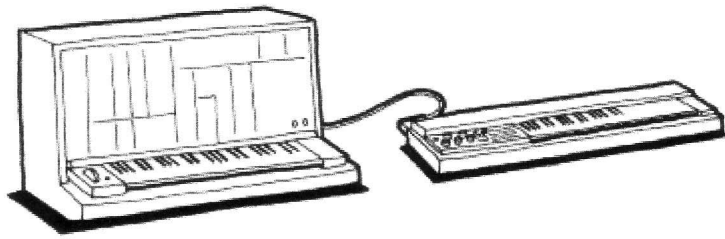


Figure 52

PS-3100 x 1
 PS-3020 x 1
 60P Connector x 1

Connections for operating two PS-3300 units by means of one PS-3100 for a seven sound source system:

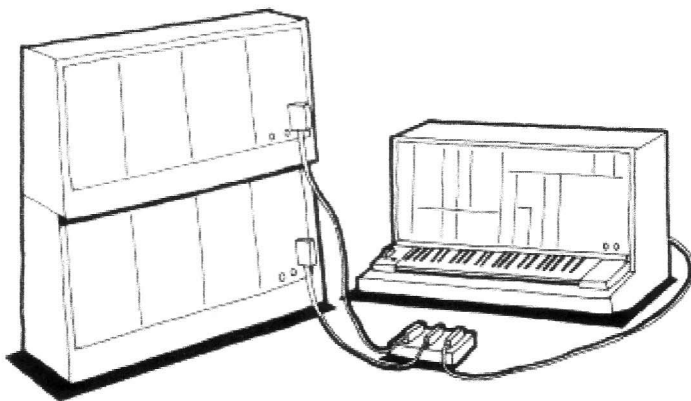


Figure 53

PS-3100 x 1
 PS-3050 x 1
 PS-3300 x 2
 60P Connector x 3

Connections for controlling both the PS-3100 and the PS-3300 by means of the PS-3040:

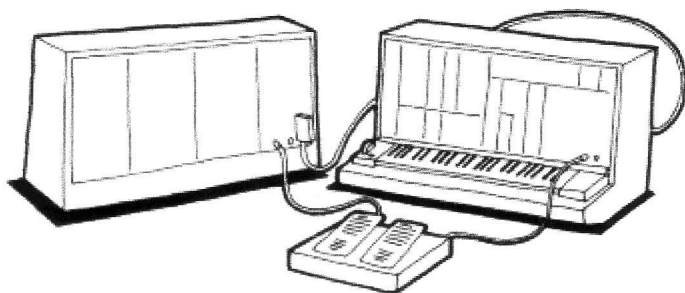
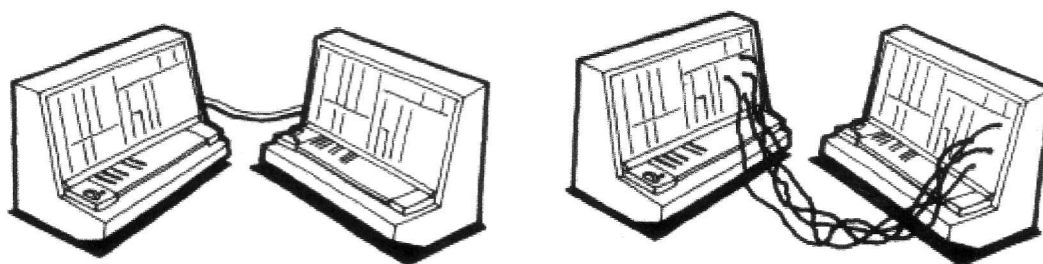


Figure 54

PS-3100 x 1
 PS-3300 x 1
 PS-3040 x 1
 60P Connector x 1
 DIN Connector x 2



4-4 THE EFFECT OF USING TWO PS-3100's

- Using 60P connector: [left]

When two PS-3100's are connected to each other, the keyboards are connected in parallel. With this arrangement one keyboard can be used to operate both units at the same time. For example you can make two completely different sounds on the two units, get the sound of a two system polyphonic synthesizer, or by changing the scale of one unit you can use this arrangement in the same way as a two sound source polyphonic synthesizer.

- Patch panel connections: [right]

Besides the keyboard connection, you can obtain a wide range of effects by setting up a Patch between the two units. You can create synchronous control capability from one unit to the other by using the KEY TRIC and MG. This is an effective method even when using the 60P connector and it is the best method when it comes to complex manual operation.

PS-3100 - Specifications

*Specifications and features are subject to change without notice for further improvement.

HANDLING SECTION

KEYBOARD:	F ~ E (4 oct) 48 Keys	
SIGNAL GENERATORS:	Wave Form	6 modes
	PWM Intensity	
	Pitch Tuning	Coarse Fine
	Scale	2'4' 8'16'
	Frequency Modulation Switch	
	Frequency Modulation Reverse Switch	
	Internal Frequency Modulation Intensity	
	External Frequency Modulation Intensity	
DYNAMIC LOWPASS FILTERS:	Cutoff Frequency	
	Peak	
	Keyboard Filter Balance	
	Expand	
	Filter Modulation Switch	
	Internal Filter Modulation Intensity	
	External Filter Modulation Intensity	
ENVELOPE MODIFIERS:	Attack Time	
	Decay Time	
	Sustain Level	
	Release Switch	
	Keyboard Hold Switch	
RESONATORS:	Resonance Intensity	
	Peak Frequency 1	
	Peak Frequency 2	
	Peak Frequency 3	
TOTAL SIGNAL MODIFIERS:	Amplitude Modulator Intensity	
	Ensemble	
	VCA 1 Modulation Switch	

	VCA 2 Modulation Switch	
	Keyboard Volume Balance	
	Final Volume	
MODULATION GENERATOR 1	Wave Form	6 modes
	Frequency	
MODULATION GENERATOR 2 (^)	Frequency	
SAMPLE&HOLD	Clock Frequency	
	Synchro Switch	
GENERAL ENVELOPE GENERATOR	Keyboard Trigger Select	
	Delay Time	
	Attack Time	
	Release Time	
	AUTO Switch	
	Reverse Switch	
VOLTAGE PROCESSERS	Voltage Processers 1	Limiter A Limiter B
	Voltage Processers 2	Limiter A Limiter B
MANUAL CONTROLLERS	Control Wheel	
	Momentary Switch	
OTHERS	Phone Volume	
	Direct Volume	
PATCHING PANEL		
SELECT SWITCHES	Modulation VCA Input Select Switch	
	Voltage Processor 2 Input Select Switch	
INPUTS	SG	Frequency Modulation Input PWM Input
	DLPF	Cutoff Frequency Modulation Input
	EM	Attack Time Control Input Release Switch Input
	VCA1	Control Input
	VCA2	Control Input
	MVCA	Control Input
	S/H	Signal Input
	MG1	Frequency Control Input

OUTPUTS	GEG	Trigger Input
	VP1	Input (Phone jack, DIN jack)
	VP2	Input (Phone jack, DIN jack)
	MG1	Output
	S/H	Output
	MG2	Output
	GEG	Output
		Trigger Out (Single)
		Trigger Out (Multiple)
	VP1	Output
	VP2	Output
	Control Wheel	Output
	Momentary Switch	Output
	Signal Outputs	Final Output
IMPEDANCE (INPUT)		Direct Output
		Phone Output
IMPEDANCE (OUTPUT)	Digital Input	1kOhm
	Analog Input	10kOhm
	Generator Output	1kOhm
SIGNAL OUTPUT IMPEDANCE	Control Wheel Output	2.5kOhm
	Final Output 2.5kOhm	(2V p-p)
	Direct Output 2.5kOhm	(2V p-p)
	Phone Output	
POWER CONSUMPTION	100V, 117V, 220V, 240V, 50/60Hz, 30Watts	
DIMENSIONS	820 (W) x 528 (D) x 360 (H) m/m	
WEIGHT	30 kg	