ANTONUS

USER MANUAL

STEP BROTHER

This project is not something static and this manual will not too, so any suggestion that help improve it in future revisions will be welcome. For any suggestion or doubt you can contact us through the following channels:

Email: info@antonus-synths.com
Web: www.antonus-synths.com
Facebook: Antonus
Instagram: @antonus_synths

First edition: November 2018.

Thanks to:

Nalini Voges for her work in all illustrations and most of tasks of this manual.

*Ernesto Romeo for his invaluable contribution both in this manual and development and conception of the **Step Brother**.*

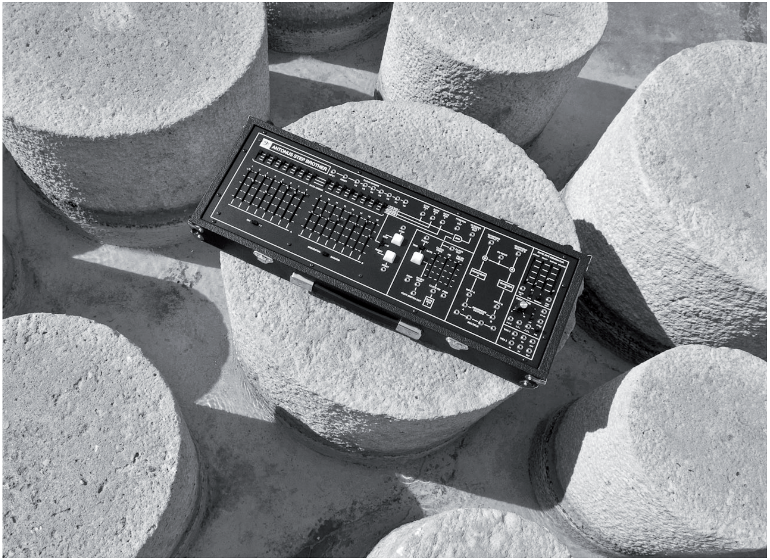
Luis Callegari for the big help and support, for the energy and for his great ideas.

*"Argensynth" Facebook community, for all the support since the beginning of the Antonus project activities until the development and pulish of the **Step Brother** as well as the trust and direct support from certain members of the group have given at the time of manufacturing the first units. Without their support this would not have been possible.*

Special thanks to Alan Richard Pearlman for his work, vision and contribution to the synthesizer history. His work and his design philosophy are the basis and motivation of all this development.

Index

Introduction



If you are reading this manual is because you have bought a *Step Brother*, which I want to thank, but you can also to be reading this just for the interest or curiosity in the instrument, in that case also thank too, more in today times where the sequencers catalogue is so large and varied.

In this manual I will try to explain and show what you can start to create with Step Brother, and I say “start” because the idea of the *Step Brother* is to be more than just a simple analog sequencer and it would be almost impossible to describe in this manual all the creative possibilities that will be given when the Step Brother starts to interact with voltage controlled modular systems.

I don’t pretend it will be a simple guide with only definition of terms and collection of adjustments. First I want reader understand a little of the “why” of this instrument, from its first idea and concept. I also want, while we are explaining the concepts of the Step Brother, that illustrations and practical examples help to the instrument understanding while reading this manual.

Toni Gutiérrez

I. Where we come from...

When setting the origin of the inspiration who motivate the development Antonus *Step Brother* is convenient to explain what is the concept of the sequencer as such (centerpiece of our instrument).

The *Step Brother* is founded around the classic design of the ARP Sequencer, one of the first analog sequencers commercialy manufactured.

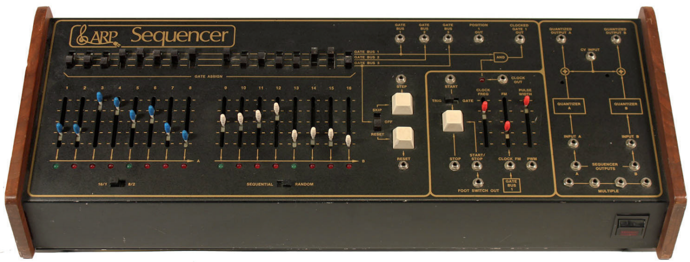
We will begin by describing what an analog sequencer means to musical electronics. The first step sequencer designs, like any pioneering development, presented some of innovative features (and exotic even to this day), which on the one side was something totally inspiring and fresh in regarding originality of processes and results, but at same time were accompanied by certain difficulties by aparent manufacture precariousness as well as discomfort due to its logic design or interface, very different from what could be the lenguaje used by musician accustomed to music figures (beat, notes, silences ...); an image that has to do more with a common score more than with all the new language provide by an instrument such as the analog step sequencer.

Moog was right to propose a very musical design -especially controls and interface- on the Moog 960, while presenting certain features which allows you to enter at experimentation fields as well as a remarkable live manipulation character, distancing the idea that a sequencer is something for program and let it just work running alone in a repetitive way. Is precisely with addition of others modules like the 962 sequential switch when live perfomance capabilities and composition possibilities begins to rise exponentially. And is with the ARP Sequencer design when you can define a series of characteristics with more friendly relation with the traditional musician, but at the same time offering very interesting functions for example to define a tuned pitch adjust thanks to the quantizer where the voltage output is scaled to allow 12 semitones steps when is applied to the control of the oscillator frequency at volt/octave relation, which no longer has the difficulties of defining tuning present in other sequencer designs where you have to tune every step with certain precision to avoid detuned notes. With the ARP Sequencer you could set a wrong note, but you couldn't be detuned while using the quantizer output. However, it had outputs without quantizer allowing path free for microtonal scales or outside the tempered scale. And that's just one part, also including three GATE BUS, a RESET function, random mode ... all in a very clear and intuitive interface, where is easy to see in each step the note position literally talking, slider potentiometers are used instead of rotative ones, so just by a fast look at panel you can see the notes easily. Also a remarkable feature of this sequencer is the wide range of operation speed. Although the internal clock just reach a little more than 100hz, nothing prevents it from moving forward with a high frequency oscillator to move it in a generous audible range, where we can jump from working in the control field to give it the task of generating audio by itself. Later will detail in this manual these experimental functions, among many others.

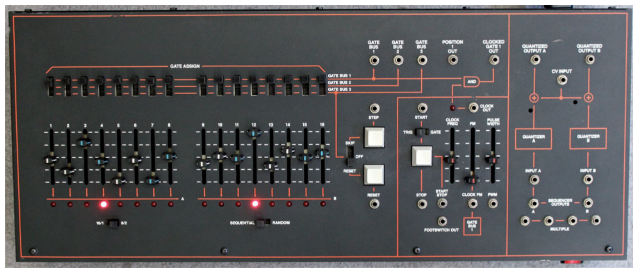
But the *Step Brother* is not simply an ARP Sequencer replica and no more. The idea of the *Step Brother* was also developed from a deep admiration for the design of the classic ARP model 2600 synthesizer. Despite the enormous benefits that have made the 2600 a mythical instrument is remarkable that a considerable number of users agree that there are only a couple or three of elements that in case of being implemented in the original design they can exponentially raised the already huge sound palette of the instrument. Combining the 2600 with the ARP Sequencer allowed to take advantage of much of the potential of both instruments, but as it was mentioned it was common to miss a couple of extra functions for advanced programming. Also visually the 2600 had a different design and intention than the Arp Sequencer. The 2600 had a design based on a Tolex transport case with a strong sound laboratory idea and transportable synthesizer. The ARP Sequencer, on the other hand, had a look with wooden sides and absence of carry options (neither protective cover, nor grabs) as well as differences in proportions of the size and shape of one instrument to other. It was remarkable not only aesthetics differences, but also "places" where to use it. It does not mean that the ARP Sequencer could not be taken from one place to another, but the 2600 design being somewhat larger is much friendly for "on the road" performance and the aesthetics in the style of the amplifier guitar combo is more "Rock And Roll".

After lot of time using these two instruments we were a large number of users who dreamed of filing and polishing those details to be able to approach it to an ideal and that way I started to develop the piece that would fit the 2600 both in function and aesthetics and even adding MIDI communication. And is not only made to complete the model 2600 even can interact perfectly with the classic and modern modular systems all without sacrificing features of the ARP Sequencer as is the clarity, comfort and ability of inspiration that has its interface. All presented in a cabinet style 2600, with lid and grip prepared for continuous travels to play on stage.

Later will detail the elements that surround the sequencer, which were conceived in such a way that their contri-



Arp sequencer 1601 with ARP Odyssey MK2 color scheme



Arp sequencer 1621 with ARP Odyssey MK3 color scheme bution is, instead of adding, is multiplying the whole range of uses that can be provided not only to the sequencer itself, but to the 2600 or any modular system.

However, the new features can be summarized from to the Arp Sequencer previous design:

1. ADSR envelope with two time multiplier.
2. VCO / LFO
3. Two VCA units
4. Frequency or clock divider
5. MIDI Clock Interface

With all this and to close, it is important to emphasize the intention of designing a sequencer that both in its aesthetics and in its functions is a self-sufficient instrument, with a lot very real-time composing and live perfoming intention, a sequencer to play pleasantly and, far from the idea of being the typical sequencer that simply plays preprogrammed sequences for repetitive accompaniments. A sequencer to play, compose and improvise.

II. Describing the *Step Brother*

The *Step Brother* is a design made with analog technology and logical CMOS, no digital processors or a microcontrollers are involved. The only exceptionwould be the MIDI clock converter which makes use of a microcontroller for managing only the incoming MIDI messages.

Choose this kind of technology today where the most simple and economic would have been to design everything controlled by digital processors or CPU, has been motivated by several reasons important issues that concern the personality of the instrument.

Using this technology at sequencer and clock divider parts gives us an special function stability avoiding any type of instructions failure or CPU hang, as well as a wide range when forcing certain parameters beyond preset limits.

This case is very particular when you experiment with graphic wave generation or subharmonic division using clock divider function at really high frequencies.

On the side of oscillator, envelope and VCA functions this technology greatly influences the temperament and color characteristic of these elements. When working with audio, the ear is specially sensitive to these qualities and details.

The completely analog design was from the beginning the preferred option and also the most sincere with the spirit of the instrument.

Furthermore, as far as components are concerned, exclusive components or custom manufactured have been avoided, all parts are comercially available during production. In the type of internal design has been taken into account the longevity and the possibility of finding answers with the passing of many years, the idea is to avoid like some classic equipment when maintaining becomes an expensive and painful task due to exclusive components difficult to obtain over the years.

Interface and distribution are presented on a surface that allows to show all the connection options without wires hindering the operation, with your view you can locate controls at all times, without having to remove annoying amount of cables with your hands.

All functions are accessible through a single function or panel control, there are no key combinations, sub menus or hidden functions that consume mental time and use of both hands. An important premise is to maintain all time the clear and intuitive interface that allows a quick and comfortable use even in cases where the user is using it for the first time and has not read the manual yet.

The different blocks are presented within the set in a differentiated way and although there are certain normalized internal connection functions, they are not many and effective, leaving the user the option to connect according to his need and his creative capacity.

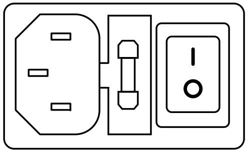
Unlike other sequencers, the *Step Brother* may seem it lacks some functions at first place, such as swing, feeling, ratcheting ... and we say at first place because thanks to the functions of the different elements that surround the sequencer we can “build” this functions or generate new effects, making the created effect a creative stimulus rather than a

fixed preset function. Of course, if you also use interconnections of these functions with external equipment, the range extends hugely in terms of resources.

The intention with all this is *Step Brother* becomes an instrument that remain for a long time in the equipment of the musician, that its use is intense and not superficial, that musician manages to develop a technique and a language of his own at the same time that the instrument inspires surprises, as well as something to always trust despite the passage of time and be able to keep it at setup, without problems and not be forced to replace it following the frenetic programmed obsolescence path.

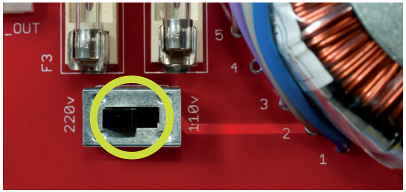
III. Power requirements

The *Step Brother* is equipped with a 3-pin IEC connector which incorporates the On/Off switch and the main fuse as well as you can see at the following drawing:



AC outlet with On-Off switch and main fuse located at rear of the instrument.

This unit can work at 110 / 120V AC or 220 / 240V AC depending on the requested configuration. This configuration is done with a switch located inside the equipment, specifically next to the transformer, where it shows the following picture:



110V - 220V selector

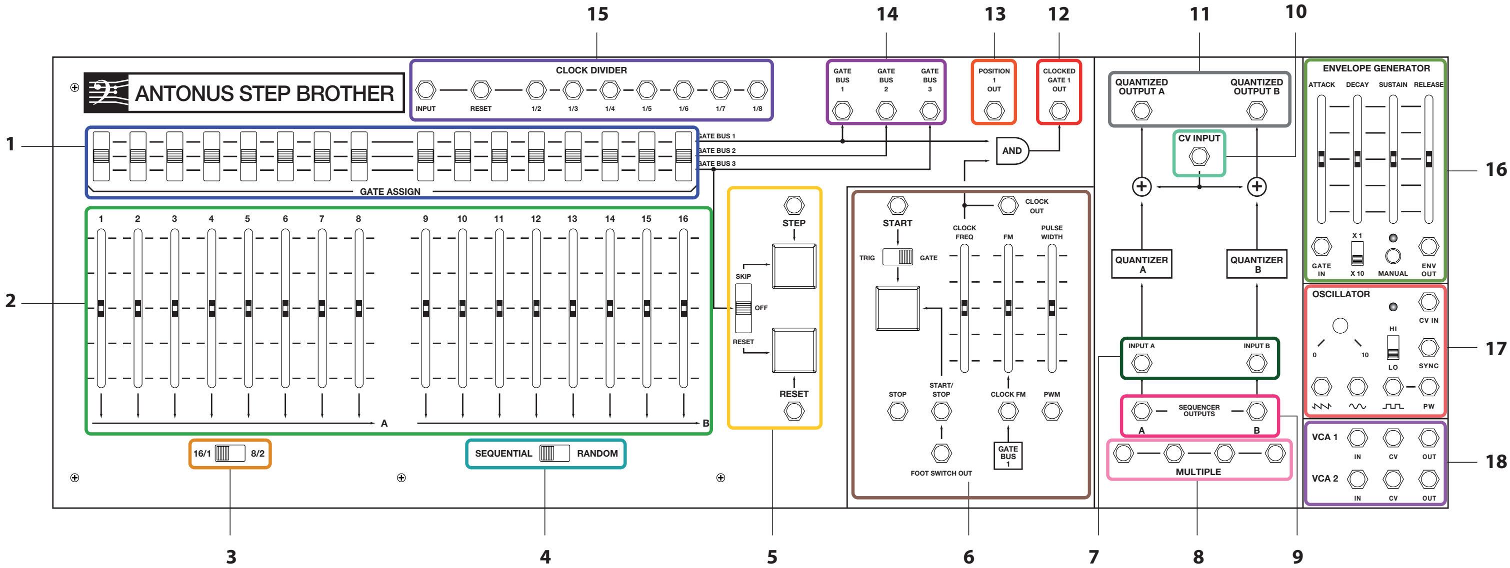
III.1. PRECAUTIONS

The Antonus *Step Brother* is a device designed with a good series of protection measures. Even with this, is recommended that user must take care like usually most electronic audio gear need.

Use the recommended supply voltage for the unit (110v-120v or 220v-240v depending on the requested configuration). To prevent damage avoid to be used in places where water or rain can acces inside the unit. You have to be careful with using or putting the *Step Brother* in places where there is a lot of dust floating. The dust is one of the main enemies of potentiometers, switches and buttons in music gear. That is why is recommended not to place a gear of these characteristics near a place that is source of dust, hair or particles in suspension, such as outside windows or air systems. It is also recommended that in case of long periods of inactivity will proceed to cover the front of the equipment well with some kind of cover or with the lid included with the Antonus *Step Brother*.

IV. Panel description

IV.1. FRONT PANEL



1 GATE assignment switches. These switch the step GATE signal to one of three output buses. These outputs can be connected (using patch cables) to control filters, amplifiers or to create accents, ratchets... etc.

2 POSITION TUNING SLIDERS. Use these sliders to fine-tune each step of the sequence, in 2 octaves range at the quantized output or 10v at non quantized outputs. Each slider have its own status led.

3 16/1 AND 8/2 MODE SWITCH. Allows the sequencer to step 16 times and then reset automatically; or step the A bank 8 times in parallel with the B bank, for harmonies, sequences of two-note intervals and other uses.

4 SEQUENTIAL/RANDOM SWITCH. Allows clock to advance to each successive position or sets clock “strike” positions randomly, much like a sample and hold on a synthesizer.

5 Skip / reset switch . Define an automatic function for BUS GATE 3, can be step skip, do nothing, or restart the sequence every time each active step is with at GATE 3 position.. This function can be complemented with any external control either by patch cable connection or by pressing button.

6 Clock control. Controls clock start or stop functions, speed and pulse width. Can be controlled both by the slider controls, buttons and the connection points for patch cables.

7 Quantizer inputs. When a patch cord is plugged into these jacks, the connection from the sequencer outputs is temporarily disconnected. The quantizer can then be used separate from the sequencer. The ranges are equal 2 octaves from 0v to 2v.

8 Multiple. It allows to divide signals for example an origin to three different destinations with the same signal. It also allows when using Gate signals to function as a simple mixer. It is not recommended to use it to mix audio or CV signals.

9 Sequencer outputs. Unquantized output, useful for controlling VCF or VCA or VCO tunning up to 10 octaves. Being not quantified it can be useful to control oscillators that do not use a V/octave standard.

10 CV input. Set a floor reference voltage for the sequence. Connect CV signal from a keyboard or other sequencer to transpose the base sequence.

11 Quantized outputs. Output quantized in semitone steps with a range of 2 octaves, useful for controlling voltage-controlled oscillators, in Volt/Octave standard.

12 Clocked Gate 1 out. Gate Bus 1 Output that responds to the pulse width of the clock. To define legatto or staccato.

13 Position 1 output. Generates a pulse every time step 1 is active, independently of the gate bus selected in it. Useful for accents or synchronizing to other sequencers.

14 Gate bus outputs. Individual output of each Gate bus.

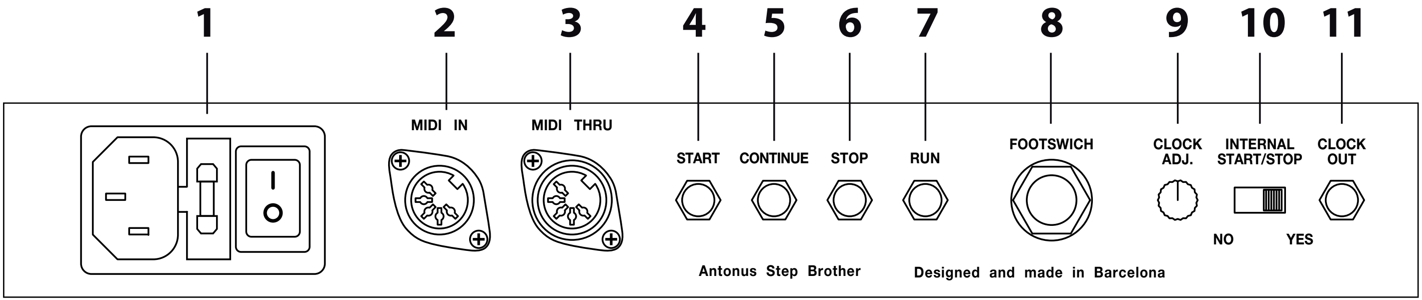
15 Clock divider. Clock input (normalized with sequencer clock output) with division outputs and reset counter input. More details in chapter VI.10.

16 Envelope generator, envelope trigger input and signal output. Control of attack, decay, sustain and final release, time factor multiplier for short/long times. Also have manual trigger button and led for visual control. More details in chapter VI.11.

17 Oscillator. Voltage control input, initial frequency manual control, synchronization / restart input, different waveform outputs and pulse width control. More details in chapter VI.12.

18 Voltage controlled Amplifier(double). Signal inputs, voltage control input and output of each VCA. More details in chapter VI.13.

IV.2. REAR PANEL



1 IEC power input socket. With general fuse and on / off switch.

2 MIDI Input.

3 MIDI Thru output to link devices.

4 Pulse output corresponding to start of sequence / MIDI song.

5 Pulse output corresponding to resume of sequence / MIDI song.

6 Pulse output corresponding to stop or pause of sequence / MIDI song.

7 Status output 5v for playback and 0v for stop.

8 Pedal input.

9 Midi clock division manual adjustment.

10 Playack mode for midi clock according to the active commands (PLAY/STOP).

11 Always active MIDI clock output.

For more details recommended to read chapter VI.14 for MIDI interface.

V. *Step Brother* sections, descriptions and uses

V.1. THE SEQUENCER

A sequencer conceptually is simply a control device. Like other control devices (LFO's, pedals, etc.), the sequencer can not produce sound by itself, it must be connected to a synthesizer (at least in theory, with the *Step Brother* we will see that we can go beyond that concept).

When the sequencer has been properly connected to a synthesizer, can be used to replace the keyboard. While the sequencer has literally hundreds of musical applications, its primary use is to create "sequences" of predetermined pitches. The way he creates sequences of pitches is creating sequences of control voltages, which in turn control the VCO oscillators in a synthesizer.

The *Step Brother* Sequencer is essentially a 16-step automatic stepping switch. For each step, the sequencer can produce a control voltage that can be adjusted with one of the 16 sliders. Therefore, a series of 16 tones can be programmed.

Various gate signals, used to trigger the envelope generator in your synthesizer, are also available from the sequencer. The sequencer contains its own VCO which is used to determine the stepping speed of the sequencer. The speed of this VCO will determine how fast the sequence of notes you have set up will be played back.

Before you hook your sequencer up to your ARP synthesizer, it will help to try a few silent experiments and familiarize yourself with several of the sequencer's features. Plug in your sequencer and turn on the power switch. The red pilot light on the switch should go on and other panel lights may go on also. Set the controls on the front panel exactly as shown in Diagram 1 (look at page 16).

Find the area of the front panel that has the three slide controls and push button (A) for the Clock Oscillator. Push the Clock Start/Stop button (A) and notice that you can start and stop the sequencing. With the clock running, move the CLOCK FREQ control (B) up and down and observe that the stepping speed changes with the position of the slider.

Stop the clock again by pressing the CLOCK START/STOP button (A), and observe which of the 16 position lights is on. Now press the RESET button (C) and note that the sequencer jumps to position 1. Press the STEP button (D) a few times and the sequencer will advance one stop each time. Experiment with the STEP, RESET, and CLOCK START/STOP push buttons until you thoroughly understand their operation.

Next, locate the SKIP/OFF/RESET slide switch (E). Move this switch to the skip position and start the clock. Now move the first GATE ASSIGN (F) switch from the center position to the bottom position. Notice that the sequence now skips position 1 and goes directly from position 16 to position 2. Move the GATE ASSIGN switch 2 down also, and the sequencer will skip both the first and second positions. Try

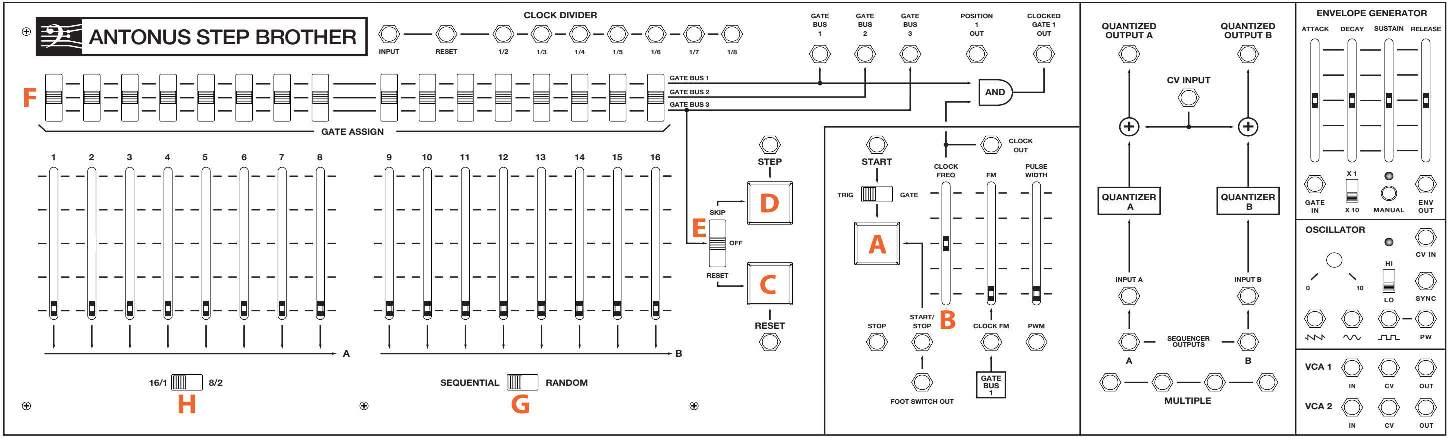


Diagram 1

moving other GATE ASSIGN switches down to get a feeling for the SKIP function.

Return all the GATE ASSIGN switches to the middle position. Change the setting of the SKIP/OFF/RESET switch to RESET. With the clock running, drop GATE ASSIGN switch 9 to the bottom position. Note that the sequencer counts up to 8, then resets. Drop GATE ASSIGN switch 5 and notice that the count shortens to 4 steps. Notice that if more than one GATE ASSIGN switch is in the lower position, the sequencer will reset upon encountering the first switch in the series. Move the SKIP/OFF/RESET switch back to OFF, and the sequencer will resume normal 16 step operation.

Return all the GATE ASSIGN switches to the middle position. Next, find the SEQUENTIAL/RANDOM switch (G). With the sequencer clock running, move this switch to the RANDOM position. Notice that the normal sequential stepping changes to random jumping from one position to another. Observe, however, that the stepping is still very rhythmical and still determined by the CLOCK FREQ control. If you watch the lights for a while, you will see that the sequence of stepping does not follow any pattern and is truly random. Try skipping a few positions as you did earlier and notice that this function still works in the random mode. When you try to reset the sequencer using the ASSIGN switches, you'll note that the sequencer will return to position 1 instead of any position where the GATE ASSIGN switch has been put in the lower position. When you have finished experimenting with the RANDOM mode, return the switch (G) to SEQUENTIAL. Return all other switches to their original positions.

Now locate the switch labeled "16/1 - 8/2" (H). With the clock running, move this switch to the "8/2" position. You'll see that two lights go on for each step. If you slow the CLOCK FREQ down for a closer look at what is happening, you should see that the two lights move in parallel and that one is always in the first eight positions and the other in positions 9 through 16. You'll notice from the panel graphics directly above the lights that the first 8 positions are grouped together by a long arrow indicated by the letter A. Similarly, positions 9 through 16 are grouped together and called B.

Essentially, the "8/2" mode has broken your 16 step sequence into two separate 8 step sequences. Move the SKIP/OFF/RESET switch to RESET and lower GATE ASSIGN switch 5. Notice that both sections of the sequencer count only four steps. Raise GATE ASSIGN switch 5, and lower switch 13. You'll see that this has exactly the same effect. Try experimenting with the RESET and SKIP functions until you are completely familiar with the operation of the "8/2" counting. Be sure to keep the CLOCK FREQ low enough so that you can observe what is going on. When you have finished, return all the switches to the original position.

Now that you have learned a little about the operation of your sequencer's stepping controls and functions, it's time to connect the sequencer to your synthesizer and begin making music.

Even for the simplest patch, you'll need two connection cables (see diagram 2). Connect from QUANTIZED OUTPUT A to the connector labeled CV IN from your Synthesizer. Connect the other cable between the sequencer CLOCK OUT connector and the GATE IN from your synthesizer.

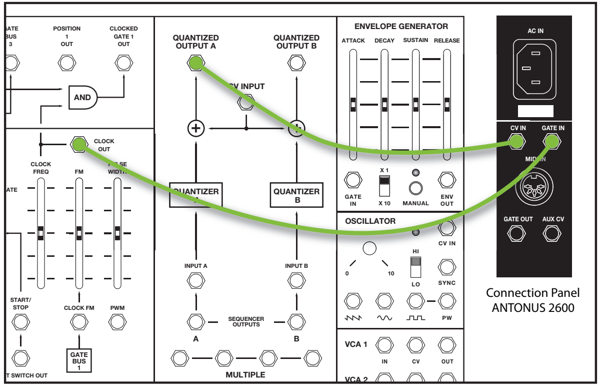


Diagram 2

VI. Using the sequencer

The first series of experiments is designed to get you familiarwith the tuning of a repetitive sequence.

VI.1. TUNING A SEQUENCE

Start by setting all the controls of your sequencer as shown in diagram 1 and connect the cables to your synthesizer as in diagram 2, but we will use the GATE BUS 2 output instead of the CLOCK OUT. Stop the CLOCK and press RESET so that the sequencer is waiting in position 1. Slowly raise the position 1 slide control on the sequencer. You will hear the pitch of the tone rise in precise chromatic semitones. You will notice that the range of this control is exactly two octaves from the bottom to the top. Bring the Position 1 slider back down when you have finished experimenting. Now advance the sequencer to position 2 by depressing the STEP button once. Notice that the position 2 slider is now active and that it behaves exactly as the position 1 did. You will note that the position 1 slider does not have any effect when the sequencer is not in position 1.

Starting at the bottom, raise the position 2 slider until the tone has gone up a major 3rd (4 semitones). Press the RESET button and the STEP button alternately to hear the two notes of the major third. Now advance the sequencer to position 3, and counting from the bottom of the slider, advance the position 3 slider 7 semitones to make a major 5th. Hit RESET and then STEP twice to hear all three notes of the major triad you have just tuned.

Continue tuning all 16 steps to play the sequence shown in this musical example:

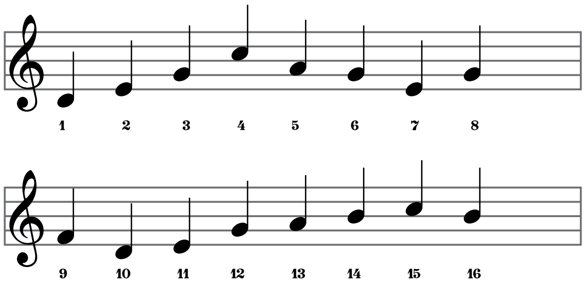


Diagram 3

When you have finished, step through the whole sequence manually to check it against the music.

Now close the VCF FREQ control so that the sound disappears. Now start the sequencer CLOCK and the 16 notes you programmed should be played back automatically. Try adjusting the CLOCK FREQ control on the sequencer to make the sequencer go faster and slower. Try hitting the RESET button in the middle of the sequence. Notice that the sequencer will return to position 1 at any time. Notice also that hitting the STEP button will cause the sequencer to advance one position, even when the CLOCK is also running.

VI.2. USING THE POSITION GATE SWITCHES

Set the SKIP/OFF/RESET switch to SKIP. Move various GATE ASSIGN switches to the lowest position and notice how the rhythmic and melodic effect of the sequence changes as you skip different notes of the sequence. By eliminating all the major thirds from the sequence, for instance, you can change the modality of the sequence so that it can be considered either major or minor. When you have finished experimenting with the SKIP function, change to RESET and observe the effect of the sequence when it is shortened. Notice, for instance, that by resetting after 3 steps (GATE ASSIGN switch 4 down) you create triplets. By raising switch 4 and lowering 5, you change to a 4/4 rhythm.

When you have finished experimenting with the RESET function, change the SEQUENTIAL/RANDOM switch to RANDOM. You will now be hearing the same 16 notes, but in random order. Change to the SKIP function and you can eliminate any notes from the sequence using the GATE ASSIGN switches.

VI.3. CLOCK FM

As you will recall from earlier discussions, the CLOCK in the sequencer is actually a VCO similar to the VCOs in your synthesizer. It is designed, however, to operate only at subaudio frequencies. The CLOCK FM input on the sequencer works in much the same way as the FM inputs on the VCO in your synthesizer. The CLOCK FM input on your sequencer is normally connected through the jack to the output of GATE BUS 1. The output of GATE BUS 1 will be 11either zero volts or +10 volts, depending on whether the GATE ASSIGN switch for each position is set to GATE BUS 1 or not. In other words, if the sequencer is in position one and the GATE ASSIGN switch for position one is up, then a +10 volt signal will appear on GATE BUS 1. If the GATE ASSIGN switch is in any other position, then GATE BUS 1 will show zero volts.

Start with all the GATE ASSIGN switches in the middle position. Raise the CLOCK FM slide attenuator half-way up. Start the CLOCK and set the CLOCK FREQ for a fairly slow tempo. Move the first four GATE ASSIGN switches up to GATE BUS 1. Notice that the sequencer steps through those positions about twice as fast as through the others. Try to adjust the CLOCK FM slider so that the first four positions are exactly twice as fast as the others. Then move different combinations of GATE ASSIGN switches to the GATE BUS 1 position to get different rhythmic effects.

Using the method described above, try modifying the sequence you have tuned to create the following rhythm:

Diagram 4

Now raise the CLOCK FM slider a little higher so that the positions assigned to GATE BUS 1 will step three times faster than normal. This adjustment can be facilitated by assigning the first three positions to GATE BUS 1, skipping 4, assigning 5 through 7, skipping 8, and so on. This arrangement will produce a triplet 1 rhythm where the first three positions take the same time as the 4th does by itself.

Set the SKIP/OFF/RESET switch to RESET. Put the 5thGATE ASSIGN switch to the low position and observe that the resultant four note sequence can still be modified rhythmically by setting the various GATE ASSIGN switches to either GATE BUS 1 or the middle (GATE BUS 2) positions.

Try different rhythms and different combinations of GATE ASSIGN switches. Notice that the SKIP function still works and that any note in the sequence can still be eliminated by "skipping".

Five simple steps for an instantaneous sequence:

These five steps were designed to help you establish a basic sequence, very quickly. You must have consider this format each time you set up sequential patch, even after you have experience in the manipulation of controls.

Step 1: Connect the sequencer to the synthesizer, just like is described in Chapter V.

Step 2: Configure the controls at your sequencer with the following way:
- a. Sequential mode 16/1.
- b. clock stopped
- c. Press the reset button.

Step 3: Set the patch on the synthesizer you want to control.

Step 4: Open the filter or the amplifier so you can listen to the oscillator you are tuning. Tune each step, one by one until you have completed the desired pattern.

Step 5: Press the start/stop button, and go!

VI. 4. USING GATE ASSIGN FOR ACCENTS

Set all the GATE ASSIGN switches up to the GATE BUS 1 position and close the CLOCK FM slider. Now remove the patch cord from the CLOCK OUT jack and plug it into the jack marked CLOCKED GATE 1 OUT. Set the release time on your synthesizer's envelope generator about half way up. Now start the sequencer CLOCK. Aside from the longer release time, you should not notice any difference at this point. Now start moving GATE ASSIGN switches back to the middle position. Notice that you will not get a new attack on a note unless the GATE ASSIGN switch is on GATE BUS 1. If you move all the GATE ASSIGN switches to the middle position, there will be no sound at all. Try it!

Try bringing the GATE ASSIGN switches back up one at a time.

Try using the GATE ASSIGN switches, along with the RESET and SKIP functions to create some interesting rhythms.

VI.5. CLOCK PULSE WIDTH

Just like the VCO on your synthesizer, the CLOCK in your sequencer produces a pulse wave output of variable duty cycle. You may recall the following illustration:

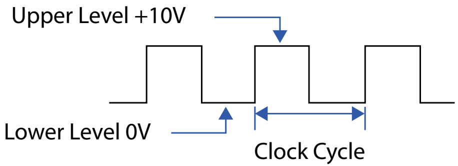


Diagram 5

During each cycle of the clock, the CLOCK OUT is at +10v for a portion of the cycle, and then drops back to 0 volts for the remainder of the cycle. If the ratio of the high portion to the low portion is very small, the waveform is said to be a "narrow pulse," and if the high portion and low portion are equal, then the waveform is said to be a "square wave".

The PULSE WIDTH slider on the sequencer allows you to vary the width of the CLOCK from very narrow to very wide. Remove the patch cord from the CLOCK GATE 1 OUT jack and return it to the CLOCK OUT jack. Move the Release time (R) on your synthesizer's envelope generator to minimum. Start CLOCK and set the CLOCK FREQ for a fairly slow tempo. Now vary the setting of the PULSE WIDTH control from bottom to top. Notice that the notes change from staccato to legato. Note particularly that the UPPER PORTION +10V PULSE WIDTH control does not effect the tempo, only the duration of the sound.

Like the VCOs in your synthesizer, the PULSE WIDTH can also be voltage controlled. An input jack, marked PWM, is provided for this purpose. With the sequencer running, set the PULSE WIDTH slider almost all the way down so that you are hearing very short staccato notes. Plug one end of a patch cord into the jack marked PWM. Plug the other end into the jack marked GATE BUS 1. All the GATE ASSIGN switches should be in the middle position at this point. Now raise the GATE ASSIGN switches one at a time to the GATE BUS 1 position and notice that as you do so, the notes corresponding to these switches become long instead of staccato.

Alternatively, you can use the foot switch to select either long or short notes. Remove the patch cord from the GATE BUS 1 jack and plug it into the FOOT SWITCH OUT jack. Plug a dummy plug or one end of another patch cord into the START/STOP jack so that the foot switch will not also start and stop the clock. Now when you depress the foot switch, a positive voltage is applied to the PWM input which lengthens the duty cycle of the clock pulse. You might wish to try using the foot switch with the CLOCK FM input and the STEP AND RESET jacks while you are experimenting with the foot switch.

VI.6. TRIG/GATE SWITCH

Remove all the patch cords and dummy plugs except the two patch cords connecting the sequencer to the synthesizer. Set up the usual sequence so that you can start and stop the clock with the foot switch. Turn the TRIG/GATE switch to GATE. Notice that the clock will now run only when you are holding down either the START/STOP button or the foot switch. If you supply a +10v GATE signal from your synthesizer to the START jack on the sequencer, the CLOCK will run only as long as the +10 volts is present. With the TRIG/GATE switch in the TRIG position, a signal applied to the START input would start the clock. The clock would then continue to run until a pulse is applied to either the STOP or the START/STOP inputs.

VI.7. POSITION 1 OUT JACK

The POSITION 1 OUT jack puts out a pulse each time the sequencer steps to position one. Get all the controls as shown in Diagram 2 again. Connect a patch cord from the jack marked STOP to the jack marked POSITION 1 OUT. Start the clock by pressing the START/STOP button. The sequencer will go around once and then stop automatically when it reaches the first position. The pulse that the POSITION 1 OUT jack puts out when the sequencer comes around to position 1 stops the clock. Take another patch cord and connect it between the TRIG OUT jack on your synthesizer and the START jack on the sequencer. You will now be able to start the clock any time you hit a key on the keyboard. The sequencer will cycle through one complete count and then stop on position 1.

VI.8. CV INPUT JACK

The CV INPUT jack allows you to “transpose” the melodic line set up on your sequencer by using the keyboard on your synthesizer. Saving the patch set up in VI.7, connect another patch cord from the CV OUT jack on your synthesizer to the CV INPUT jack on the sequencer. The voltage from your synthesizer keyboard will now be added to the outputs of the sequencer, thereby transposing the preset melodic pattern.

VI.9. SEQUENCER OUTPUTS

In the lower right hand corner of your sequencer you will find two output jacks labeled SEQUENCER OUTPUTS. Set up the patch shown in Diagram 2 once more, and hit the RESET button. You will recall that by moving the slider for position 1 up and down, you get a chromatic scale. Now remove the patch cord from QUANTIZED OUTPUT A and plug it into the SEQUENCER OUTPUT jack just above the MULTIPLE. You will note two changes in response to moving the position 1 slider. First, the pitch moves continuously, rather than in semitone intervals. Secondly, the pitch range of the slider is much greater, approximately 10 octaves vs. 2 octaves for the QUANTIZED OUTPUT.

Because the SEQUENCER OUTPUTS are continuous and very wide range, they are not recommended for determining pitch. You will find it very tricky to tune an accurate melodic line with the SEQUENCER OUTPUTS. The wide range of these outputs can be very useful for other effects, however.

Move the patch cord back to the QUANTIZED OUTPUT A. Set up the patch shown in Diagram 6 (page 23). Set the ATTACK and RELEASE sliders on your synthesizer’s envelope generator to minimum and set the SUSTAIN control to maximum. Note that the sequencer is set for 8/2 operations. When you start the clock, an eight note sequence will be heard. The pitches of the eight note sequence are of course determined by the settings of the first eight sliders. The second eight sliders (9 - 16) are connected to the PWM input and hence will determine whether notes will be short or long. The higher the slider setting, the more sustained the note. Slow down the clock, if necessary, to observe the effect carefully.

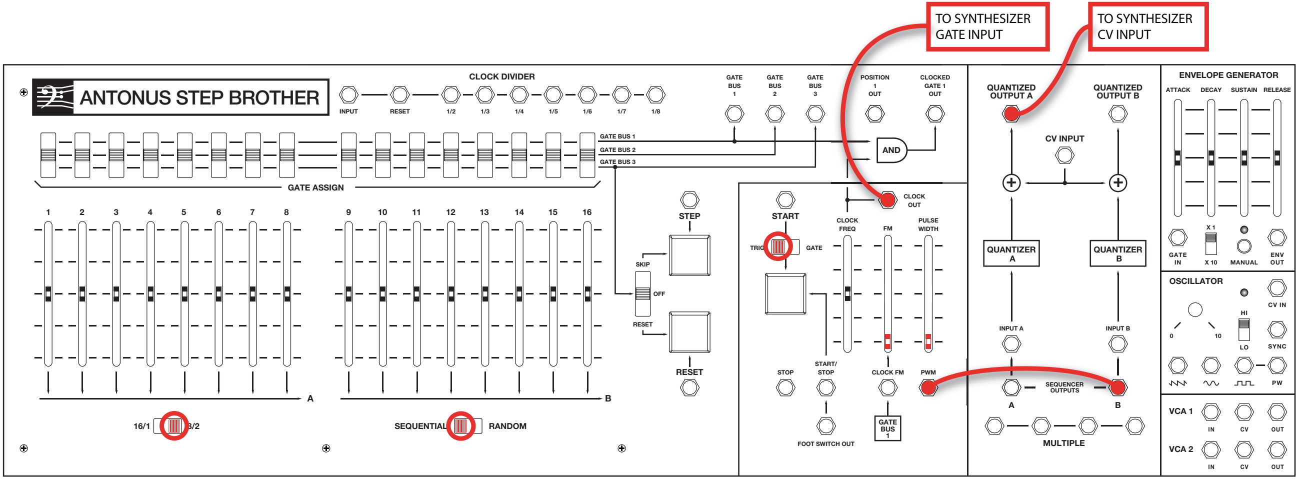


Diagram 6

Alternatively, you can use the SEQUENCER OUTPUT to control the brightness of the sound for each pitch, thereby creating accents. This patch can be created easily on a 2600 by simply connecting the SEQUENCER OUTPUT to the VCF control input.

VI.10. CLOCK DIVIDER

The Clock Divider section of the *Step Brother* corresponds to a frequency divider, or also a clock divider when your work with time / sync clock signals. At a conceptual level, it will allow us to obtain from a periodical signal a subdivision of the main frequency signal present at the input. So for example the subdivision of 2 will give us a signal that will be half the frequency original being its square waveform regardless of the waveform used as the input source. This is because the divider circuit counts how many times the signal crosses the positive axis and then generates a pulse corresponding to the divider output.

In this divider design, unlike other designs where the division factor must be selected in its output, we have all subdivisions at same time in each output 2-3-4-5-6-7-8. We must point the use of unusual subdivisions, since the most common in this type of circuits are those of base 2 (2-4-8) however in this design we have in turn the divisions of 3-5-6-7 (see diagram 7).

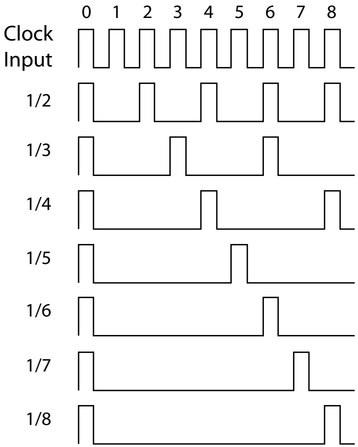


Diagram 7

Completing the circuit is the RESET input in order to reset the counter when required.

In the *Step Brother* we have the sequencer clock output signal normalized to clock divider input. That internal connection can be interrupted with the jack insertion.

In the next example we are going to use the output /4 for modulate the pulse width of the clock, resulting every 4 steps, one step will be more sustained time than the rest of Steps. For this we need that the enevelope levels at the VCA are suitable for the effect.

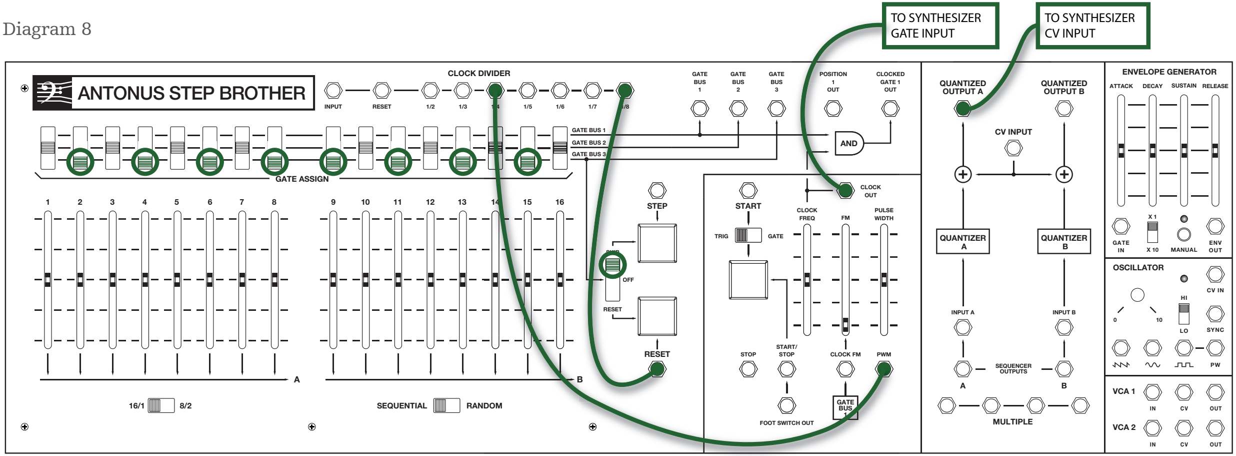
To take advantage of the availability of simultaneous outputs we will also make an example through which we will restart the sequencer using a subdivision signal, for example 1/18 to limit the sequence to 8 steps. We will connect the 1/8 output to the RESET input of the sequencer This patch has a particularity, giving the possibility of use the GATE BUS 3 to SKIP function at the same time that we restart the sequence every 8 steps, obtaining different sequences of eight steps depending on the steps we are going skipping. We can also experience playing with leaving active less than 8 steps and see the result of phase or phase shift at the restart of the sequence (diagram 8 on page 25).

Using the clock divider as a audio frequency divider:

A particularity of this analog divider design is that it will allow us a range of frequencies higher than other designs based on digital processors that suffers from aliasing if their processing is not enough fast. This advantage will allow us to work with signals beyond 20 Hz and be able to work succesfully up to high audio frequencies. In this way we will be able to obtain from an audio oscillator signal its lower octave, which would be the classic sub-oscillator sound of classic synthesizers. As we said in this design we have an original subdivisions that are outside of the base of 2, being possible to get sub-oscillators that go to a third, a fifth, a sixth, or a seventh of the frequency initial. Adding these divisions with the original signal or between the divisions themselves we can obtain intervals or chords. Note that the division will result in mathematical intervals which will not exactly coincide with the tempered scale. However, the results can be very interesting for experimentation.

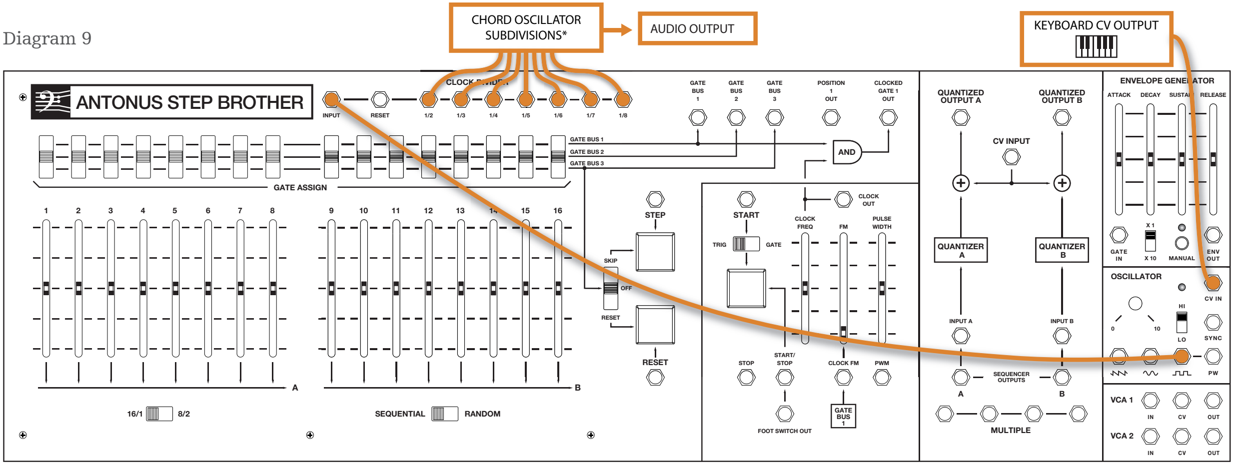
In diagram 9 (page 25) we are going to use an audio mixer to compose in real time different chords not tempered from an original monophonic signal.

Diagram 8



Skip steps using "bus 3" to obtain different sequences.
Adjust tunning sliders as you like.

Diagram 9



* Mix the audio outputs as you like.

VI.11. ENVELOPE GENERATOR

The ENVELOPE GENERATOR is a dynamic control signal generator where a voltage will change depending on its control parameters such as ATTACK time, DECAY time , SUSTAIN level and RELEASE time. Keep in mind the parameters of attack, decay and final release are time parameters and the sustained control is a level control.

The envelope generator produces a signal when a GATE signal is present at its input. At the start of a GATE signal,

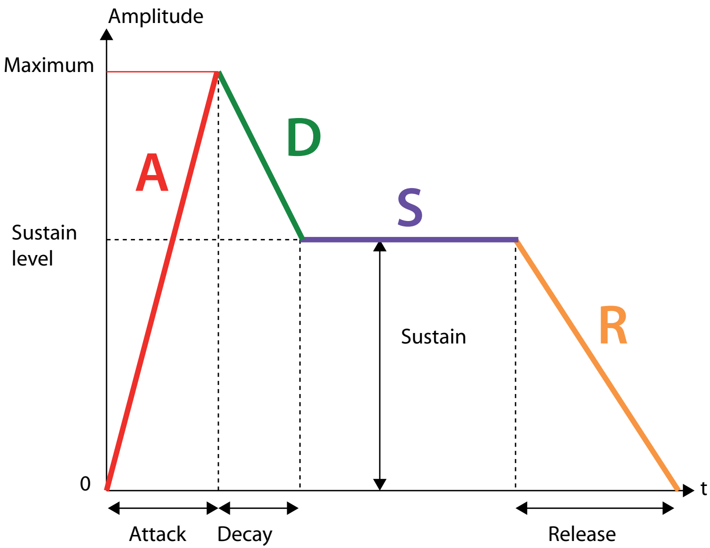


Diagram10

the output voltage increases to + 10V at a time determined by the adjustment of the ATTACK time control. If the GATE signal is still present when the output reaches + 10V, the output starts to decrease immediately (if the SUSTAIN level is below the maximum), at a speed determined by the DECAY control until reach level set at the SUSTAIN level control. The output voltage will remain at this level, as long as the GATE signal remains in the EG input. When the GATE signal is low, the voltage output returns to zero at a speed determined by the RELEASE time control. If the GATE signal goins down at any point during the envelope time, the output voltage begins immediately to decrease to zero at a speed determined by the RELEASE time control setting.

In this envelope generator design we have two time factors, where the position x1 defines a range of short times for work with precision when need to adjust a very fast envelope for example in bass sounds, or percussive sounds. The x10 range is more suitable for slow envelopes of evolution character.

The manual control is a trigger button that allows to start the envelope manually, which can be use in the absence of GATE control signal or by adding to any GATE signal present at the input of the envelope generator.

The indicator light will bright like the voltage level created , being a simple and direct visual monitor of the envelope generator.

This envelope generator is an analog classic design to give an excellent response in transients and fast times, as well as slow and smooth evolutionary curves without no stepping feeling by digital quantification.

The analog nature allows to trig the envelope in audio cycles for example using an oscillator in the trigger input, offering a signal with no artifacts or alisasing present in digital low resolution envelopes.

Note that when you intend to use the envelope as an oscillator waveform the attack time and decay are very sensitive factors in those results. For that is recommended to use the x1 factor and adjust with accuracy depending on the range of frequencies that we work.

VI.12. OSCILLATOR

The *Step Brother* have a versatile voltage controlled oscillator of multiple simultaneous waves.

The oscillator can workin two different ranges depending on its base frequency, the HI position, would be a range between 20 Hz and 10 Khz approximately and the LO range corresponding to a range between 20 seconds per period and the 40 cycles per second, more siutable for low frequency modulations. The LO mode is recommended for modulation functions and for generation of additional clock signals, allowing ranges from very slow to audio range frequencies for more intense modulations.

The HI position allows you to use the Oscillator as a classic VCO. Using your CV input we can use a voltage control coming from the sequencer output or the control signal coming from a keyboard with CV outputs to play tuned at the tempered scale. Very important point that the standard of this CV signal follows the Volt/Octave. In case of using a control signal coming from a keyboard or sequencer that follows a scale of Volt/Hertz commonly used in analog synthesizers of Korg and Yamaha we will not be able to match the curve of tuning if we have not previously made a conversion of your curve through a V / Hz to V / Oct converter (diagram 11).

This works either with Hi or Lo position.

The Sync input provides us the possibility to restart the oscillator waveform causing a cycle abrupt restart each time it receives a trigger signal in this input.

A common use is working in LO mode, restarting the cycle for example using a signal from the sequencer gate bus or a clock divider signal. Working in HI mode it is typical to use another VCO at a lower frequency while altering the timbre using for example the frequency potentiometer or if we add a signal that modulates the signal that controls the *Step Brother* oscillator obtaining a classic sound of «Hard Sync». In the following graphs we can see the examples more clear. (diagrams 12 and 13).

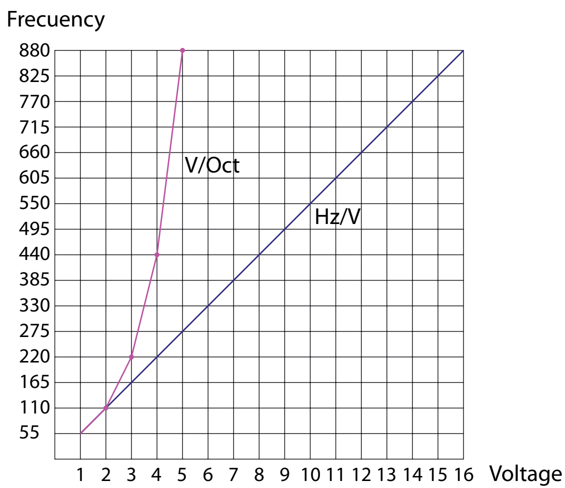


Diagram 11

The *Step Brother* oscillator have 3 simultaneous waveforms, that means we can use one waveform for one function and still have the others for other differents.

The RAMP output provides a falling ramp waveform. In addition to its classic sound timbre, this descending waveform allows us to work to modulate at low frequency periodically like a simple looping decay envelope. This signal is bipolar.

The SINE output provides us a classic vco pure sound. Ideal also for slow periodic modulations, for example modify the pulse width from an oscillator. This signal is bipolar.

The PULSE output provides us a pulse waveform whose width can be modified in real time by the lateral adjustment potentiometer being able to proportionally lengthen one of the two flanks of the waveform, even making it to disappear the waveform when the control reach any of the two extremes.

In addition to the classic range of timbres offered by this output, it should be noted that its range is unipolar unlike of the other waveforms, this is so that its operation is optimal when in low frequency we use it for trigger logic or control functions, since some control modules do not usually receive or "understand" in a correct signals that have signal component below of 0v. The light indicator shows us the oscillation period quickly and easily, especially in low frequency. It should be noted that the indicator light works in a binary way between a positive half cycle and negative and that specifically follows the behavior of the pulse signal to visually be able to see the positive or negative half-cycle percentage quickly as well as see even if by extreme adjustment of the width of pulse we have cancelled the oscillation at the pulse output.

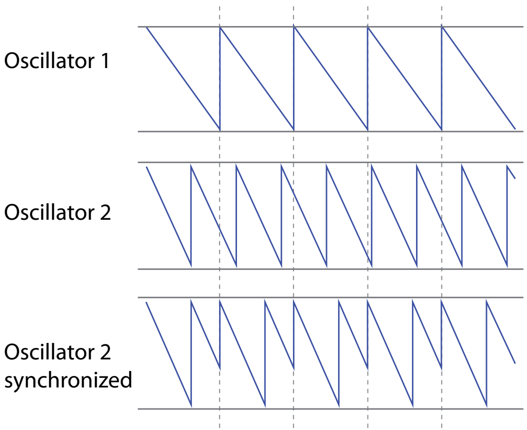


Diagram 12

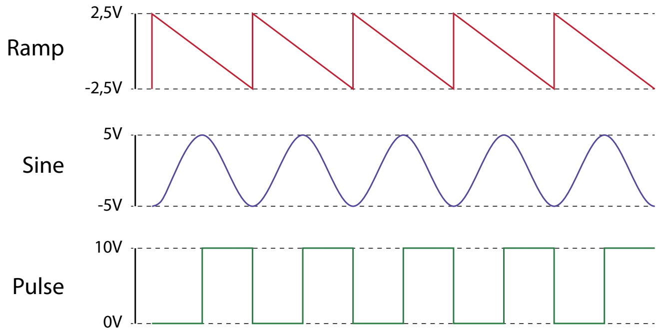


Diagram 13

Important to say that the design of this oscillator is full analog without any digital control. That is why it is recommended in the case of needing a completely stable tuning, wait a time of about 10 minutes of initial warm-up since the equipment has been turned on, so tuning and response curve are completely stable during the performance. When designing this analog part prevailed the sound character, ranges and behavior of a classic VCO design over the immediacy in tuning of an oscillator generated or controlled digitally.

VI.13. VCA

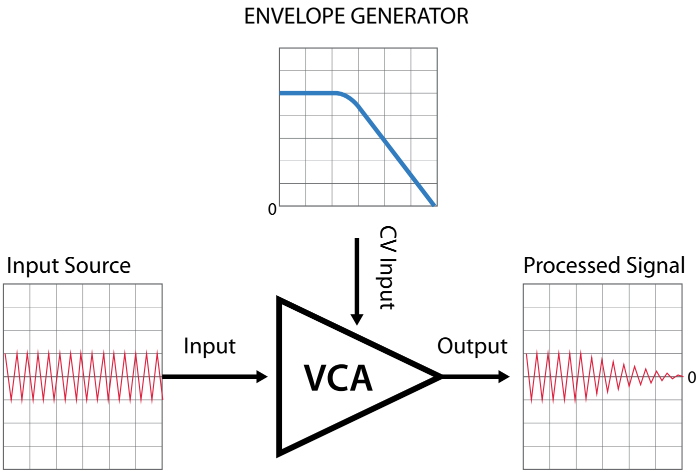


Diagram 14

The *Step Brother* has two voltage controlled amplifiers, which will allow us to control the amplitude level of the input signal (carrier) through a voltage control signal (modulator). This design is 100% analog allowing a smooth control without staggered effects, which is especially useful when we need to control dynamically, a control signals of sensitive parameters like oscillator tunings where a stepping by digital quantification would be very noticeable.

Carrier input can work bipolar signals and unipolar. The modulation input only works with unipolar signals, ignoring any value that is below 0v.

In addition to its dynamic use, we can use the VCA as a simple voltage-controlled switch using any GATE output from the sequencer at the CV input.

In addition to offering dynamic control over signals from audio or control, it is convenient to mention the use as a logical function for trigger signals or GATE in which case its logic gate behavior would correspond to the AND function, explained in the following graphic:

A	B	OUTPUT
0	0	0
0	1	0
1	0	0
1	1	1

Diagram 15

The two VCA's are independent from each other and can be used to completely different functions without being their performance affected.

VI. 14. MIDI INTERFACE

The Antonus *Step Brother* is provided with MIDI connectivity through the interface located at the back of the instrument. Also have a MIDI input and a chain output (THRU). The MIDI input is intended to receive the MIDI clock signal as well as the playback commands, Play, Pause, Stop. These messages are independent of the transmission channel so is not necessary to adjust any reception channel for work with those commands. The rest of other MIDI commands received are ignored by the internal converter.

The bridge output (THRU) transmits the same MIDI signal that is received at the input, both the MIDI CLOCK signal like any MIDI instruction that is transmitted at the same time, it will not filter anything that is received at the MIDI input. This is to allow a chaining of MIDI devices like example diagram 16.

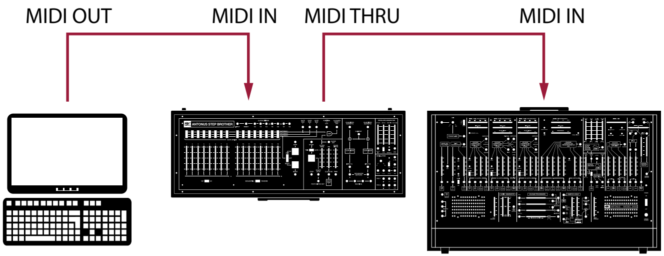
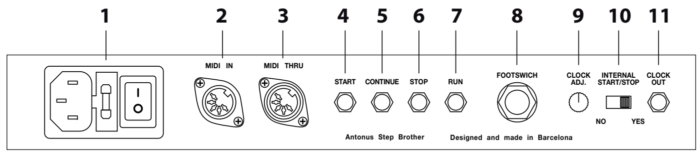


Diagram 16

In the diagram we see how the *Step Brother* receives the MIDI signal from the main computer, and the THRU output continue the communication until we reach the synthesizer. The *Step Brother* will use the MIDI clock signal and playback commands and the synthesizer will respond to the commands of note, channel, CC, sysex... or MIDI clock too in short it will respond to any command that the main computer is transmitting since it is a transmission without command filtering.

It should be remembered that this transmission technique based on chaining THRU ports in series can be useful when there are few splices, between 1 and 3 devices, but due to latencies imperceptible at optocouplers (but that added in chain could be noticed) it would not be recommended to make long chains of more than 3 or 4 devices chained by THRU to avoid synchrony problems. For connections of 5 or more MIDI devices that depend from the same connection it would be advisable to use a star type connection using a MIDI Splitter device.

Let's proceed to describe the MIDI interface functions using the graphic on the back panel:



1 IEC power input socket. With general fuse and on/off switch.

2 **MIDI Input**

3 **MIDI Thru output to link devices.**

4 **Pulse output corresponding to start of sequence/MIDI song.**

5 **Pulse output corresponding to resume of sequence/ MIDI song.**

6 **Pulse output corresponding to stop or pause of sequence/MIDI song.**

7 **Status output 5v for playback and 0v for stop.**

8 **Footswitch input.**

9 **Midi clock division manual adjustment: adjusts the division of the incoming MIDI clock. The most usual MIDI clock signal is transmited with 24 ppqn that would be 24 pulses per quater note. This value is usually the most usual, although some other systems may have a different pulse ratio. Also a ratio of 24 pulses per quarter it would be something that does not correspond with the standard of 16 steps of an analog sequencer like the one we have in the *Step Brother*. For this case we have a real-time adjustment for subdivide in different ratios. For example the case of a computer that sends MIDI clock at 24 ppqn, so if we want to match the metric to a 16 step measure let's select position 4 of the adjustment divider. It is important to know that the signal converted from the MIDI clock does not replace the internal clock signal of the *Step Brother* or any signal that is connected to the STEP input, which in the presence of several signals of clock would be added when moving the sequencer. So to avoid clock summing when using MIDI stop first the internal clock from the *Step Brother*.**

POSITION	DIVISION	MUSICAL VALUE
1	1	12 clocks per quarter note
2	2	6 clocks per quarter note, 1/16th note triplets
3	3	4 clocks per quarter note, 1/16th notes
4	4	3 clocks per quarter note, 1/8th note triplets
5	6	2 clocks per quarter note, 1/8th notes
6	8	1.5 clocks per quarter note, 1/4 note triplets
7	12	1 clock per quarter note, straight 1/4 notes
8	16	3 clocks per bar, 1/2 note triplets
9	24	2 clocks per bar, 1/2 notes
10	32	1.5 clocks per bar, whole note triplets
11	48	1 clock per bar, whole notes
12	96	1 clock per two bars

10 **Playback mode for midi clock always run or play stop dependent.**

11 **Always active MIDI clock output.**

VII. Advanced techniques

The *Step Brother* as we said have a flexibility from the design and technology used, that allows to take beyond certain parts that were originally intended to be controls and that in a certain way they can change the role from modulator to be signal generators. Is particularly interesting to change the role of the sequencer to a graphic waveform oscillator.

The concept would be the following: the sequencer can reproduce a series of voltages periodically, but instead of using those voltage variations to control a oscillator let's "listen" to those voltage cycles. For it we will use the non quantized output (figure 9 on the front panel). Due to technical issues (amplitude and resolution) it is not recommended to use the quantized output.

We can connect that output to VCF input or even direct to a VCA input or audio output module for to be able to hear the result.

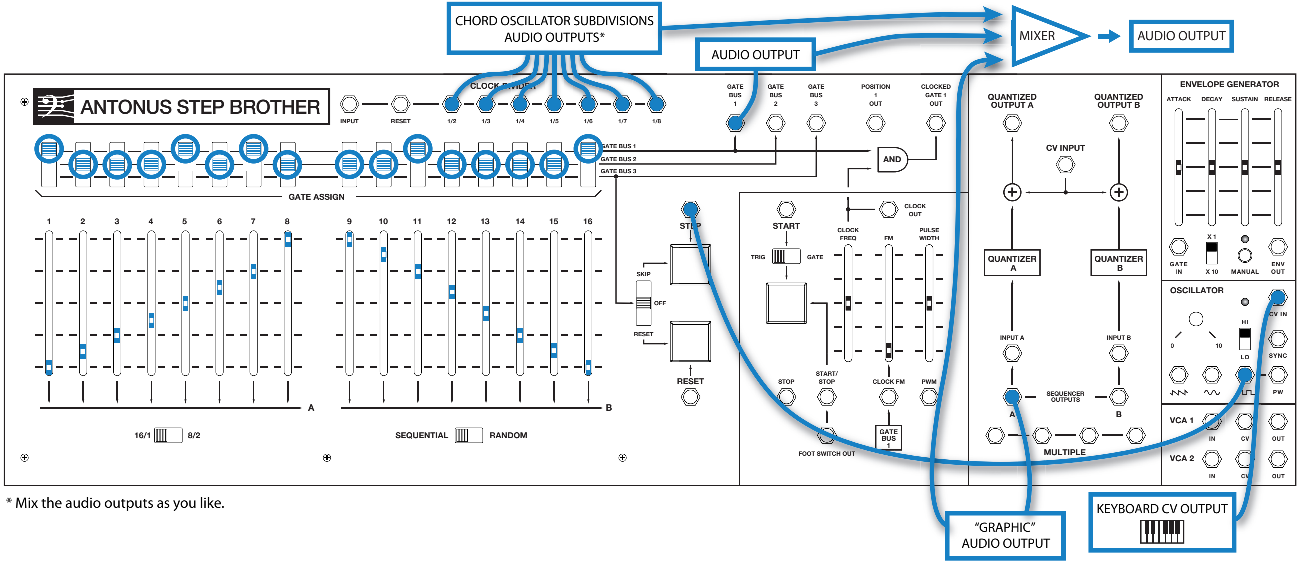
Getting up the clock speed to the maximum we will not be able to obtain enought tonal height, despite the maximum 100 Hz of the clock in its maximum position. This is because if we use a sequence of 16 steps we have to have in mind that each cycle advances one step whereby to obtain a complete waveform cycle the result at 100 pulses per second equals wavelength of 100/16 = 6.25 Hz. So we will not be able to hear the fundamental frequency when it is below the 20 Hz lower limit of human hearing. The sound that we can hear will be the variations transients of each step, but never a fundamental frequency at such a low frequency.

Although we shorten the steps length, in order to obtain higher frequencies we would not get very far either, a minimum sequence of 2 steps would give us a oscillation frequency of 100/2 = 50 Hz plus that being only two positions the result would always be a square wave.

We're going to need to use a voltage controlled oscillator that allows to reach sufficiently high frequencies as to "move" the 16 steps of the sequencer fast enough so that the entire cycle reaches frequencies of at least 5 Khz, (in that case we need a VCO that reaches up to 80 Khz. It should be noted that for this master oscillator function it is recommend to use shaped oscillators of pulse wave type , with enought amplitude and if possible unipolar (does not pass through the negative half cycle) able to adjust the pulse width of the master oscillator since at high frequencies beyond 20 Khz certain oscillators distort the square wave and may lose the effect of operating the sequencer, needing an adjustment of pulse widht to recover the compatible form with this function.

We also use a VCO that follows a Volt for Octave standard, to be able to use the "graphic oscillator" in a musical way using keyboards or other sequencers to drive that master oscillator.

With this configuration ready, we can draw or compose the waveform using the tuning sliders of every step. The speed of sweep is so high that it gives feeling that all the led lights of each step are turned on at same time, offering a very visual and direct representation of the waveform that we're drawing in real time.



* Mix the audio outputs as you like.

Diagram 17

From here we have an extensive path for experimentation, playing with different numbers of steps (change the fundamental), use the rest function with another oscillator (hardysnc), use the GATE BUS output to add different harmonics... etc. If something invites this function is to experiment while enjoying the concept of "visualize an oscillator".

VII. 1. STACKING TWO SEQUENCERS

Basically, there are two ways to connect two sequencers: series and parallel. The series connection allows the first sequencer to turn on the second, then turn itself off. Essentially, they alternate their control of the synthesizer. In the parallel arrangement, both sequencers are operating at the same time, working together to achieve an effect. Here, the sequencers are interfaced with each other, usually a little differently than with the series method.

SERIE

Diagram 18 (page 35) indicates the connection for achieving 32 positions from two 16 note sequencers. Set up the patch as shown in the diagram. Raise position gate 16 to gate bus 1 on each sequencer. Then advance (depress STEP button) the sequencer to position 16. The clock frequency can be set differently for each sequencer because sequencer A turns on sequencer B when position 16 is reached by A. Then A turns itself off. The clock frequency of each sequencer should be adjusted so that rhythmic cadence is kept when you are using this patch in a musical context. Both clocks do NOT have to run at the same speed, however, and interesting results can be achieved in this manner.

Now raise position gate switches 4 and 10 on sequencer A and switches 2 and 14 on sequencer B to gate bus 1 position. Drop position 16 to gate bus 2 or 3 on each sequencer. As you learned earlier in this manual, more than one GATE ASSIGN switch can be raised to the GATE BUS 1 position. Once the sequencers are set up this way, manually step sequencer A to position 4. This will turn on sequencer B until it reaches position 2; then A will advance to position 10; then B will advance to position 14; then A will advance through 16 and continue on to position 4. You still have 32 notes, but now sections of each sequencer are used alternately.

Now set the GATE ASSIGN switches as before with just position 16 used on both A and B. When B's TRIGGER/GATE switch is changed to TRIGGER (A still in GATE position) B will count it's sequence 16 times. A will advance one position for every 16 counts of B. A will transpose the key of B's starting note 16 times until A counts to position 16 when it will count through it's sequence once and then repeat this whole set of events. Using the RANDOM position will add excitement to the way this patch performs. Also, you can place sequencer A's clock into TRIGGER mode and leave sequencer B in GATE mode. The reverse effect has now been set up.

PARALLEL

For operation in the parallel mode, diagram 19 (page 36) illustrates a unique melodic effect. Set up the tuning as illustrated and start B with the START button. This will also start A. Changing and cascading harmonies are possible in this manner when the two sequencers are operating with different reset positions. If sequencer A's CLOCK OUT light is on all the time when this patch is operating, it means that A is turned on in addition to being stepped (slaved to B). Simply depress the START button and the CLOCK OUT light will follow the beat of B's clock.

We can't show you all the possibilities but when your imagination takes over, you'll easily see the unlimited versatility and applications of multiple sequencer events.

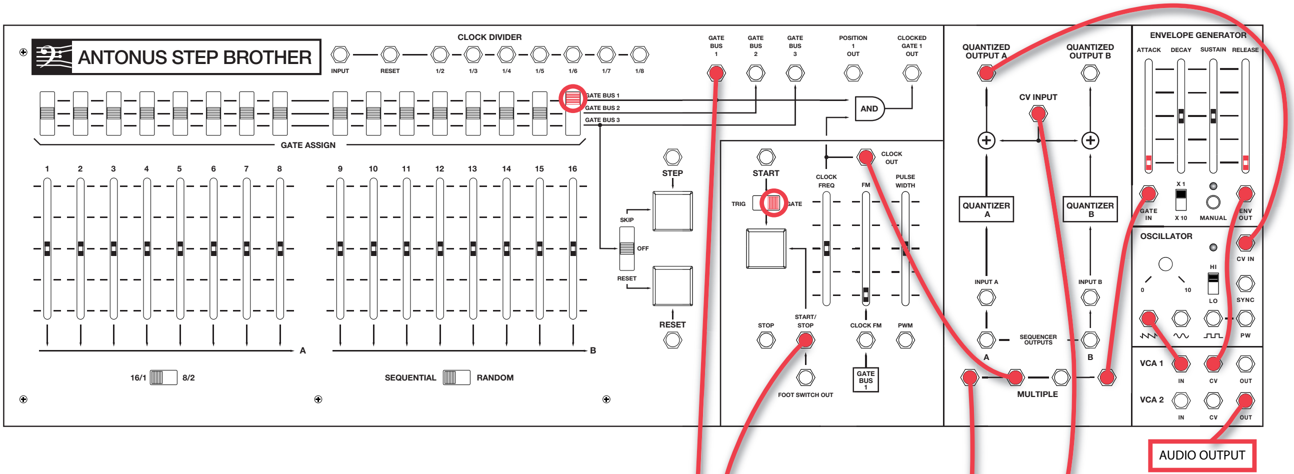
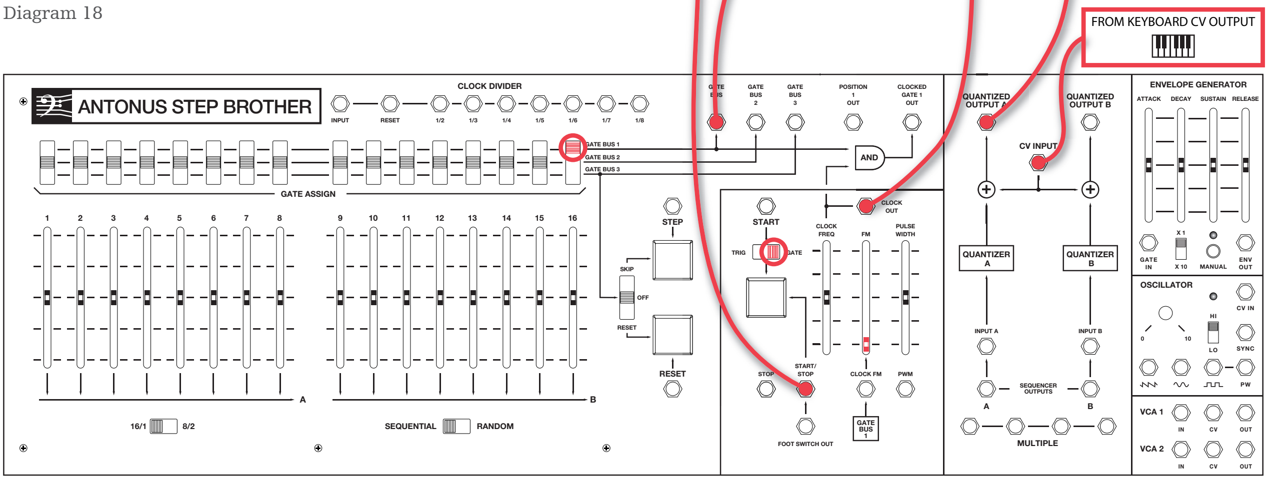

ANTONUS STEP BROTHER
CLOCK DIVIDER
INPUT
RESET
1/2
1/3
1/4
1/5
1/6
1/7
1/8
GATE BUS 1
GATE BUS 2
GATE BUS 3
GATE ASSIGN
POSITION 1 OUT
CLOCKED GATE 1 OUT
AND
STEP
SKIP
OFF
RESET
START
TRIG
GATE
CLOCK FREQ
FM
PULSE WIDTH
CLOCK OUT
STOP
START/ STOP
CLOCK FM
PWM
FOOT SWITCH OUT
16/1
8/2
SEQUENTIAL
RANDOM
QUANTIZED OUTPUT A
QUANTIZED OUTPUT B
CV INPUT
QUANTIZER A
QUANTIZER B
INPUT A
INPUT B
SEQUENCER OUTPUTS
MULTIPLE
ENVELOPE GENERATOR
ATTACK
DECAY
SUSTAIN
RELEASE
GATE IN
X 1
X 10
MANUAL
ENV OUT
OSCILLATOR
CV IN
HI
LO
SYNC
PW
VCA 1
VCA 2
IN
CV
OUT
AUDIO OUTPUT

Diagram 18


FROM KEYBOARD CV OUTPUT
ANTONUS STEP BROTHER
CLOCK DIVIDER
GATE ASSIGN
QUANTIZED OUTPUT A
QUANTIZED OUTPUT B
CV INPUT
ENVELOPE GENERATOR
OSCILLATOR
MULTIPLE

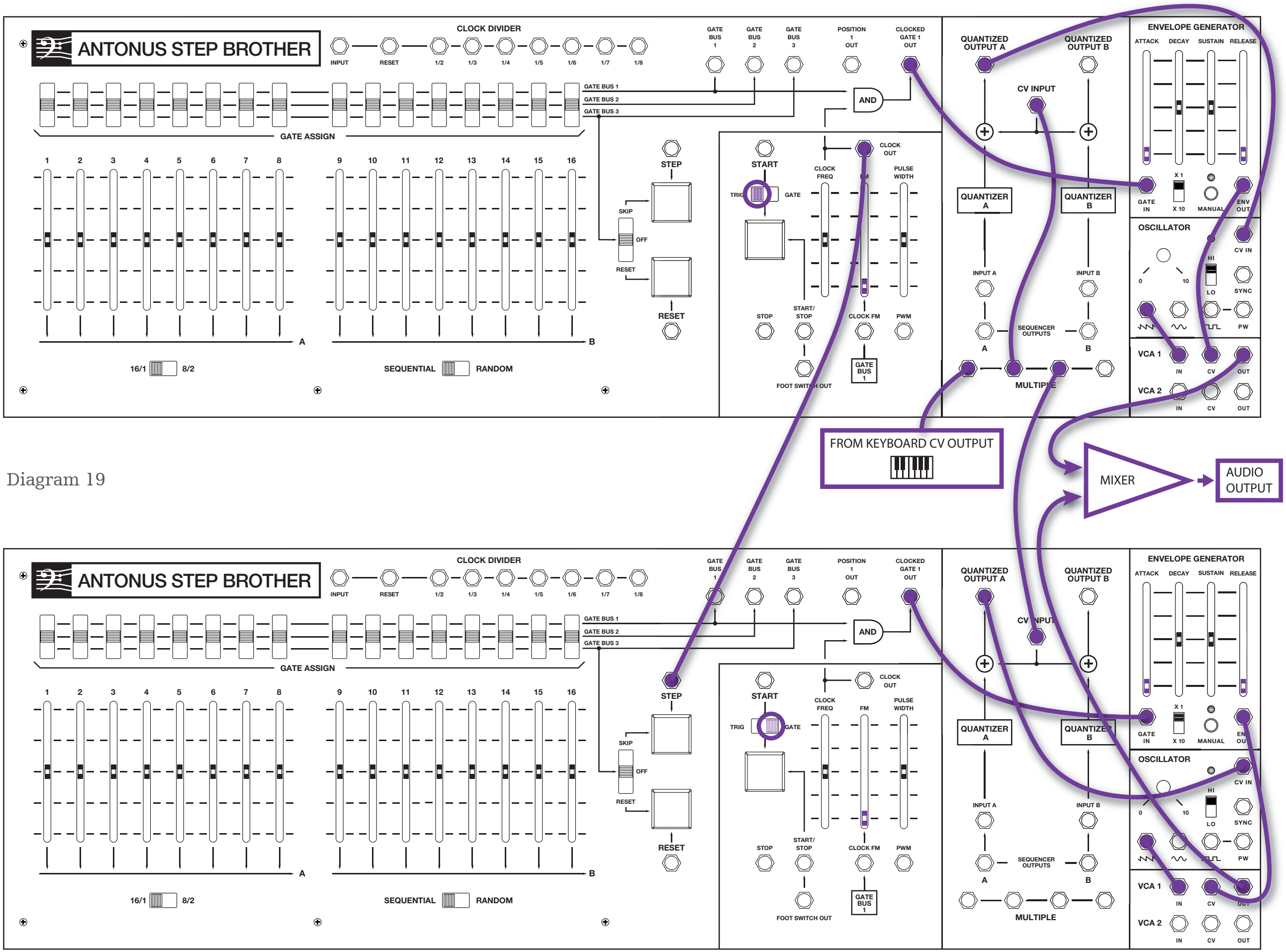

ANTONUS STEP BROTHER
CLOCK DIVIDER
INPUT
RESET
1/2
1/3
1/4
1/5
1/6
1/7
1/8
GATE BUS 1
GATE BUS 2
GATE BUS 3
GATE ASSIGN
STEP
SKIP
OFF
RESET
16/1
8/2
SEQUENTIAL
RANDOM
A
B
GATE BUS 1
GATE BUS 2
GATE BUS 3
POSITION 1 OUT
CLOCKED GATE 1 OUT
AND
START
TRIG
GATE
CLOCK FREQ
FM
PULSE WIDTH
CLOCK OUT
STOP
START/STOP
CLOCK FM
PWM
FOOT SWITCH OUT
GATE BUS 1
QUANTIZED OUTPUT A
QUANTIZED OUTPUT B
CV INPUT
QUANTIZER A
QUANTIZER B
INPUT A
INPUT B
SEQUENCER OUTPUTS
MULTIPLE
ENVELOPE GENERATOR
ATTACK
DECAY
SUSTAIN
RELEASE
GATE IN
X 1
X 10
MANUAL
ENV OUT
OSCILLATOR
CV IN
HI
LO
SYNC
PW
VCA 1
VCA 2
IN
CV
OUT
FROM KEYBOARD CV OUTPUT
MIXER
AUDIO OUTPUT

Diagram 19

VIII. Troubleshooting

Problem	Solution
The sequencer clock does not respond well to start or stop, is always stopped or always running.	Check there is no cable connected to the rear pedal input. If there is some cable plugged, disconnect it.
The clock only starts while I hold down the START button but if loose it then does not stay.	Check the TRIG-GATE clock mode on the front panel.
Using MIDI clock the sequencer ignores the commands MIDI PLAY STOP.	Check the position of the rear switch to select the MIDI clock running mode.
Using the MIDI clock, I have a strange speed or time and when I press STOP on MIDI reproduction it continues running but at different speed.	Check you do not have the internal *Step Brother* clock running. Keep in mind that the two clocks are going to sum if they are on at same time. To avoid conflicts you can put the *Step Brother* clock in GATE mode to avoid accidentally starting if you involuntary touch the PLAY STOP button on the panel.
I have connected by MIDI but the sequence goes very fast in the *Step Brother* and it goes out of phase with song of the master MIDI sequencer I'm using.	The control of the rear potentiometer number 9 CLOCK ADJ must be used. With this you have to adjust the beats per measure of the MIDI sequence to the step by step of your sequence in the *Step Brother*. Keep in mind that although the potentiometer is continuous, the adjustment value becomes effective when each new measure plays. It is remarkable when you are adjusting with long divisions and you have to wait for each new beat to hear the new subdivision.
I am using the *Step Brother* sequencer with my Korg MS-20 and the note scale do not sound tuned and out of sync.	The *Step Brother*'s sequencer works by volt-by-octave ratio in its quantized output, which today has become a standard. In the

	Korg MS20 like other Japanese synthesizers of the 70's and 80's have a ratio of volt per herz. In this case, the output should be used without quantizer and you will need to fine-tuning each step. Also in Japanese synthesizers had a different note trigger rule, in this case it is appropriate to process the gate signal. If you have a Model 2600 we can use the processor voltage for this work, but if we do not want to use that resource or do not have it, you must use an external converter to ensure total compatibility.
I am using the oscillator with sine wave at slow speed, it seems to work fine but the led is always active or it is always off, it seems that it did not oscillate but I still hear the ouput is sending sine wave.	The led shows the oscillation of the pulse waveform. If the adjustment of the pulse width potentiometer is near of some extreme then it going to reflect an absence of oscillation but only in the pulse output. When moving the adjustment a little we will see again blink again the led if we work at slow speeds. In high speed mode obviously the eye will not be able to distinguish the on and off cycle.
I'm using the *Step Brother* as a graphic oscillator but neither the pitch or volume or tuning I have is what expected.	In this working mode is necessary to take note not to use the quantizer output. To use the sequencer as a graphic oscillator you have to use the direct output number 9. Be careful also that the quantizer output does not remain looped with the CV signal that feed the VCO that is used as the driver of the *Step Brother*'s sequencer in audio mode. This would produce weird tones and tunings.
I'm working in 8/2 mode, I want to work with sequences of 8 steps, however, the sequence is restarted or is set in step 1 even part A does not have any GATE BUS 3 position active for RESET function.	Check that you do not have any step using GATE BUS 3 in part B and this GATE BUS is selected as RESET. You must have in mind that in the 8/2 mode the two buses of each part are going to sum if they are present on each side with different state. In the first sections of this manual, it is explained as an example of first steps.

IX. Specifications

Sequencer

Maximum Step numbers 16
Maximum (unquantized) control voltage ouput.................... +12V
Maximum Gate output voltage .... +14V
Mode 16 X 1 .... A & B channels together
Mode 8 X 2 .... A & B channels separated
Step, Reset, Start, Stop and
Start/Stop jack inputs .... Accepts +3 V to +10 V Gate

Clock

Type .... Voltage Controlled
Pulse Width .... 10% to 100% (less 5 msec.)
Pulse Width Modulation Input .... Accepts 0 to +10 volts
Frequency Range.. 0.2 Hz. to 100 Hz.
FM Range .... 2V/OCT max.
Output level .... +14 V pulse wave

Quantizer

Function .... Rounds off" voltages to nearest 1/12V(semitone)
Maximum Input Voltage (A & B) .... +10V
Maximum Quantized CV Output (A & B) .... +2V
Range .... 2 octaves

Clock divider

Input level .... +3v to +14v.
Ouput level .... 8v.

Envelope generator

Input level .... +3v to +14v
Maximum Ouput level .... +10v

Times:
Minimum Attack 1,5ms-
Maximum Attack .... 70 s.
Minimum Decay 1,5ms
Maximum Decay .... 150 s.
Minimum Release .... 4ms.
Maximum Release .... 150s.

Oscillator

Initial frequency range HI .... 20hz to 10khz
Initial frequency range LO .... 20s. to 40hz
CV input .... volt/octave
Falling ramp ouput level.. +5v -5v
Sine output level .... +5v -5v
Pulse ouput level.. +10v 0v

VCA

Input .... DC coupled, bipolar.
CV input .... DC coupled unipolar positive.
Output .... DC coupled, bipolar.

MIDI interface

Clock and trigger outputs .... 0 to +5v
MIDI Thru .... not filtered

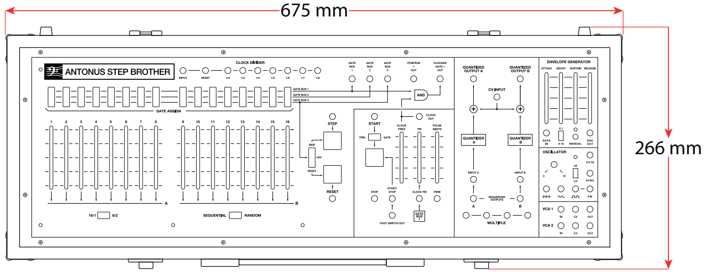
Physical characteristics

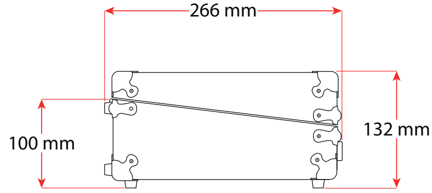
Weigh .... 5kg closed
Dimensions .... 60 x 30 x 12 cms

Voltage power requeriments

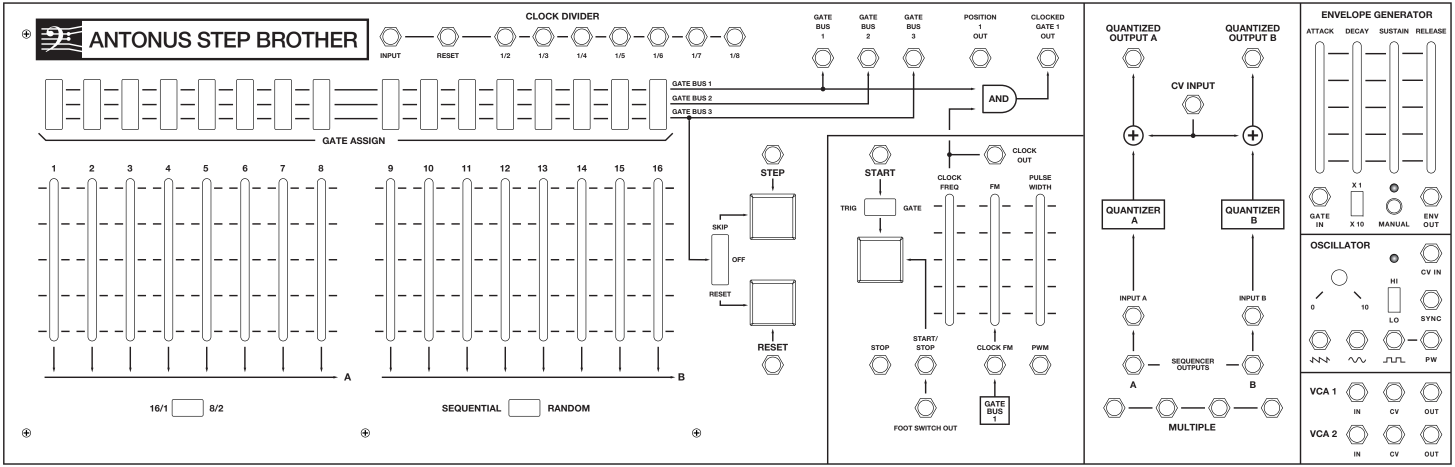
AC Input .... 100 / 240 V AC (select by internal switch)
Power frequency .... 50-60 Hz.
Operating power .... 30 watts

Dimensions

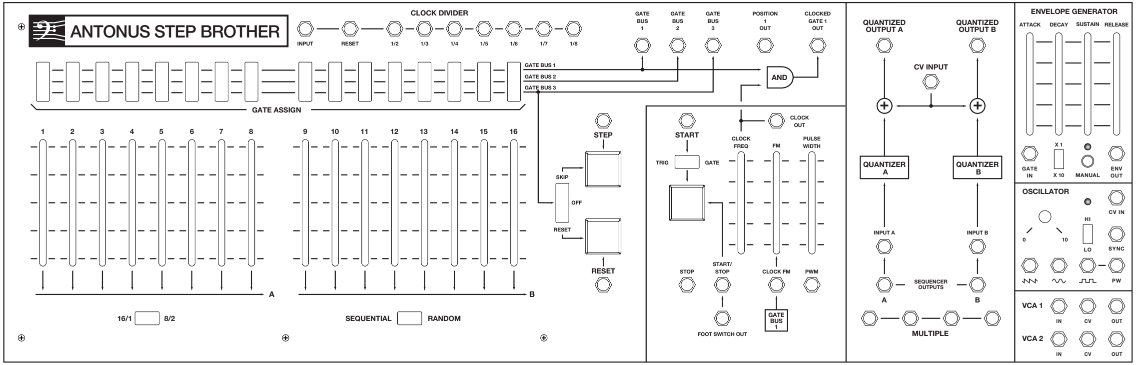


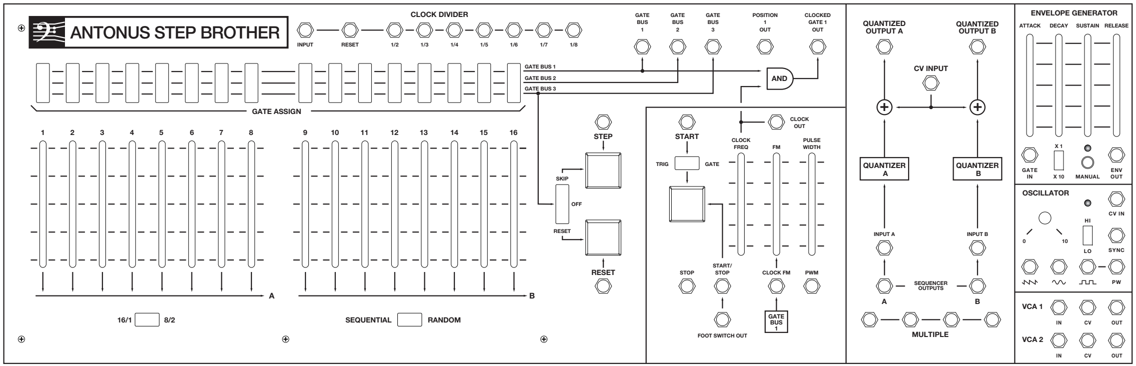


X. Patch sheet



Notes


ANTONUS STEP BROTHER
CLOCK DIVIDER
INPUT
RESET
1/2
1/3
1/4
1/5
1/6
1/7
1/8
GATE BUS 1
GATE BUS 2
GATE BUS 3
POSITION 1 OUT
CLOCKED GATE 1 OUT
AND
GATE ASSIGN
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
A
B
16/1
8/2
SEQUENTIAL
RANDOM
STEP
SKIP
OFF
RESET
START
TRIG
GATE
CLOCK OUT
CLOCK FREQ
FM
PULSE WIDTH
STOP
START/ STOP
CLOCK FM
PWM
GATE BUS 1
FOOT SWITCH OUT
QUANTIZED OUTPUT A
QUANTIZED OUTPUT B
CV INPUT
QUANTIZER A
QUANTIZER B
INPUT A
INPUT B
SEQUENCER OUTPUTS
A
B
MULTIPLE
ENVELOPE GENERATOR
ATTACK
DECAY
SUSTAIN
RELEASE
X 1
X 10
GATE IN
MANUAL
ENV OUT
OSCILLATOR
CV IN
HI
LO
0
10
SYNC
PW
VCA 1
VCA 2
IN
CV
OUT


ANTONUS STEP BROTHER
CLOCK DIVIDER
INPUT
RESET
1/2
1/3
1/4
1/5
1/6
1/7
1/8
GATE BUS 1
GATE BUS 2
GATE BUS 3
POSITION 1 OUT
CLOCKED GATE 1 OUT
AND
GATE ASSIGN
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
A
B
16/1
8/2
SEQUENTIAL
RANDOM
STEP
SKIP
OFF
RESET
START
TRIG
GATE
CLOCK OUT
CLOCK FREQ
FM
PULSE WIDTH
STOP
START/ STOP
CLOCK FM
PWM
GATE BUS 1
FOOT SWITCH OUT
QUANTIZED OUTPUT A
QUANTIZED OUTPUT B
CV INPUT
QUANTIZER A
QUANTIZER B
INPUT A
INPUT B
SEQUENCER OUTPUTS
A
B
MULTIPLE
ENVELOPE GENERATOR
ATTACK
DECAY
SUSTAIN
RELEASE
X 1
X 10
GATE IN
MANUAL
ENV OUT
OSCILLATOR
CV IN
HI
LO
0
10
SYNC
PW
VCA 1
VCA 2
IN
CV
OUT