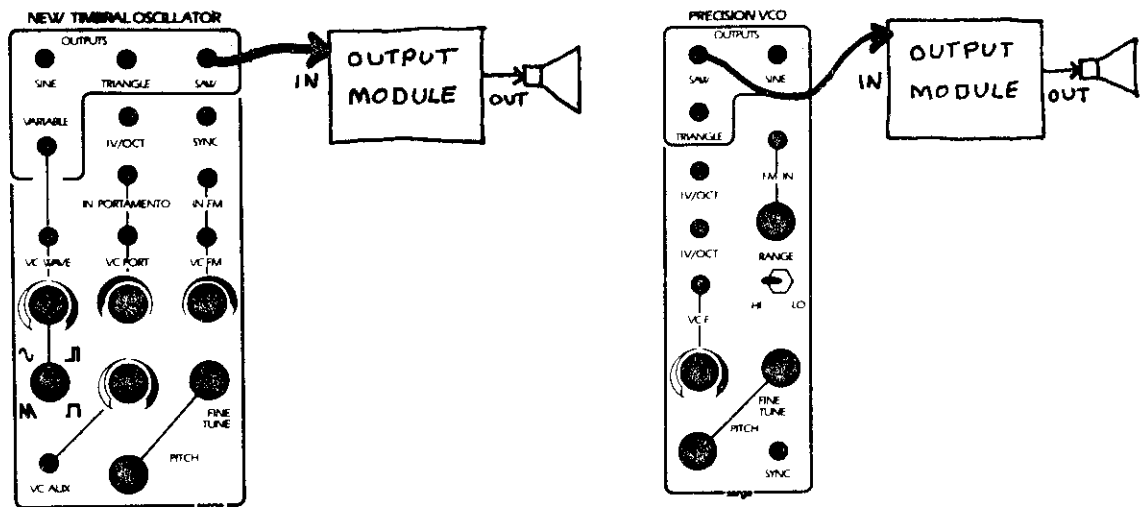


LEARNING PATCH NUMBER ONE

Or, Making Sounds Knowing Nothing.

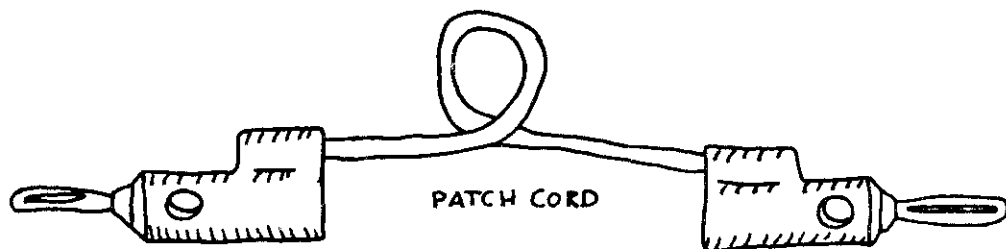
STEP ONE

1.1 Locate a Precision VCO or a New Timbral Oscillator on the Serge. If you choose to use a Precision VCO, set its Range switch to HI. Both of these modules are Oscillators and differ from each other only by some special features. All identically labelled modules are identical and interchangeable, so that if the system contains more than one of these modules any of them will do. For brevity these two modules will be referred to as "OSC".



In the following discussion the Precision VCO will be used as the example Oscillator module, though the New Timbral Oscillator can be substituted as in the above diagram.

1.2 It should be clear that all of the jacks on the OSC, though of different colors, are Banana jacks, as are almost all the connectors on the Serge system. This means that only one kind of plug is needed to patch from anything to anything else: a banana to banana cord. This kind of cord, since it is the primary cord for patching various modules together, we will simply call a PATCH CORD.



1.3 At the top of the OSC there is an OUTPUT section containing three jacks labelled SAW, SINE, and TRIANGLE. Like most modules on the Serge the output section will be enclosed within a border. Take one end of a Patch cord and insert its plug into the jack labelled SAW. The other end of the cord should be inserted into "Input 1" of the output module (see previous section). Make sure that the volume control on your amp is all the way down.

In the above diagram, and in all subsequent diagrams in this section, a patch cord will be shown by a thick line drawn between the appropriate jacks on the modules. The output module will be shown as a square with Input 1 labelled. The amplifier/speaker is shown by a small speaker.

1.4 On the OSC you will find a POT that is labelled PITCH. (POT is the name given to all knobs on synthesizers because beneath the faceplate the knob turns a potentiometer.) Turn this POT so that its pointer is set to 11 o'clock.

1.5 There should be no sound from your speakers until, slowly, you turn up the volume on your amp. You should hear a buzz. Set the volume on the amp so the sound is at a comfortable level. Try moving the PITCH POT back and forth. You should hear a whining sound that moves up and down not unlike the sound of a police siren. The further the Pitch POT is turned clockwise the higher the sound becomes; the further counterclockwise, the lower the sound.

TROUBLESHOOTING

IF YOU HEAR NO SOUND, then it is time to "troubleshoot"--that is, to look for the problem and fix it. This should be done as methodically as possible and with as cool a head as you are able to muster. Things go wrong for the best engineers. Learning how to troubleshoot is just another, and rather important, thing to learn about synthesizer playing. Below are some elementary trouble-shooting steps if no sound is heard: (Be sure to do these things one at a time.)

A. Check to see that amp, pre-amp and Serge system are all plugged into an AC outlet and that each device is turned on. All the modules on the Serge are turned on by the single master switch. If there is a Touch-Activated Keyboard Sequencer in the system, one of the red lights on one of the touch pads should be lit.

B. Visually check that everything is patched correctly together. The SAW output of the OSC to Input-1 of the output module. The output of the output module to the amp. The amp to the speakers.

C. Check that OSC's pitch POT is set to the 11 o'clock position and that the small switch on the PCO is set to HI (if you are using the PCO as the OSC). Try moving the pitch pot right and left to see if anything happens.

D. Check the settings on your Output module against the settings listed.

E. Check to see that all the settings on your pre-amp are correct. It should be set to AUX if the synthesizer is patched into AUX. The tape monitor switch should be off. Try unplugging the cord that goes to the amp from the Output module and touching the disconnected end with your finger. If the amp and speaker are set up correctly you should hear a buzz or hum.

F. If all else fails try switching the patch cords. It would not be the first time that a patch cord or adaptor was broken. Try a different OSC.

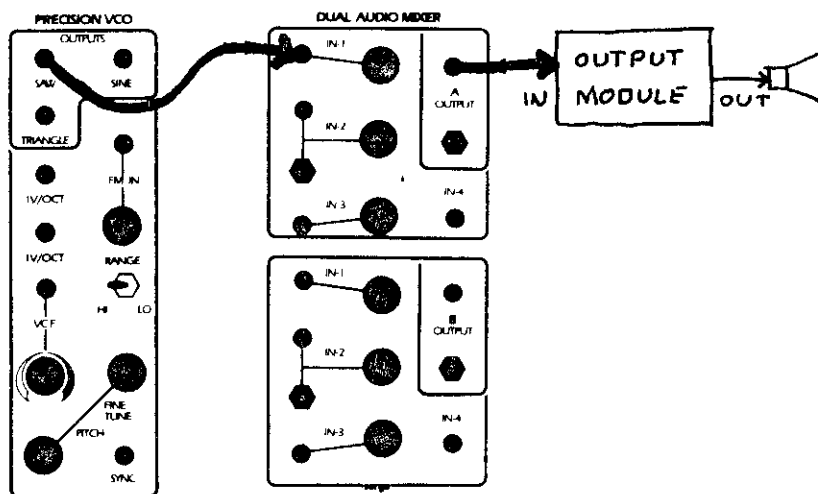
Now that you have your first PATCH working there are a few things you can try:

1.6 Try turning the Pitch pot as far to the left as it will go. At some point it will start to become a series of clicks. Then try turning it as far to the right as it will go. The pitch will get higher and higher until it is barely within the human range of hearing. Try turning the POT labelled "fine tuning". Like the Pitch POT it alters the Pitch, but over a much smaller range.

1.7 Unpatch the plug inserted into the SAW output. The sound will suddenly stop. Re-patch into the SINE output and then the TRIANGLE output. You should notice a difference in sound quality between these outputs. This quality is called "timbre" and is one reason why different instruments playing the same pitch can be distinguished. For instance, a piano playing a middle C and a violin playing a middle C are distinguished by their timbres.

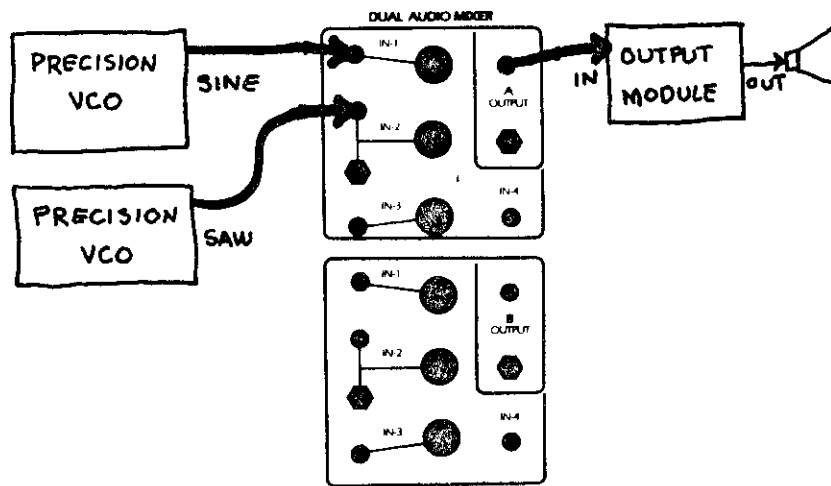
STEP TWO

2.1 On the Serge system find the module labelled Audio Mixer. Like a few modules on the Serge this is a double module, that is, it is actually two identical modules, one above the other. For this patch use the top one.



2.2 Patch the SAW out of the OSC to "IN-1" of the Mixer. Patch the output of the Mixer to Input-1 of the Output Module. The POT that is associated with IN-1 by a line should be turned full left. Make sure that the Pitch POT on the OSC is set as in STEP ONE.

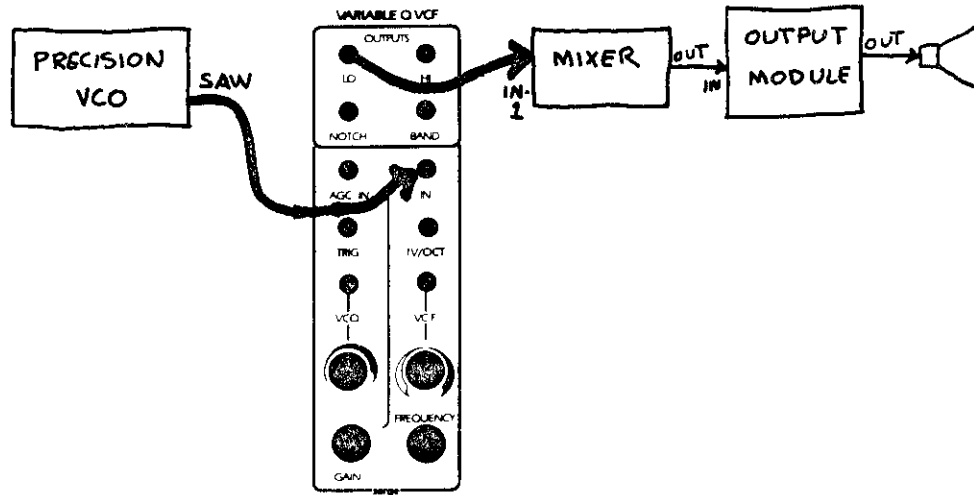
2.3 Slowly turn the POT associated with IN-1 to the right. The buzzing sound heard in STEP ONE should now once again be heard from the speaker, but at a softer volume. By turning the Mixer POT further and further to the right, the sound can be made louder and louder.



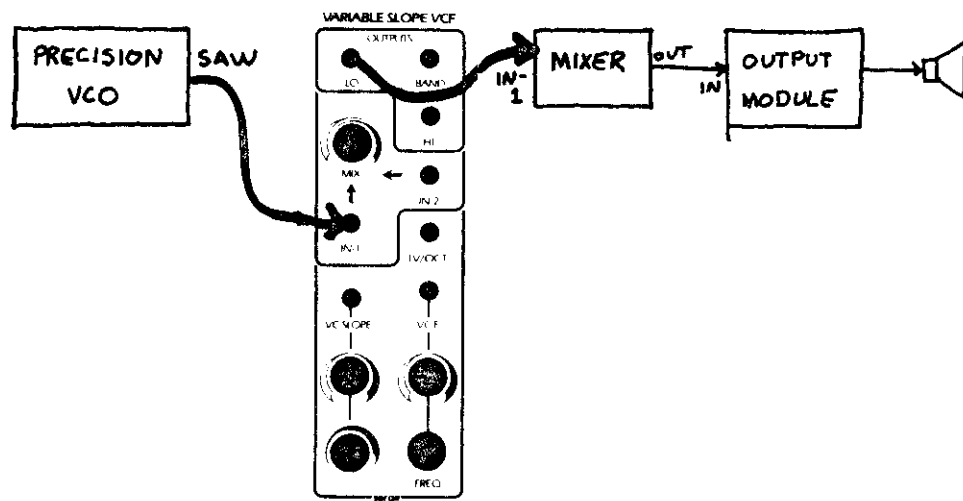
2.4 Using a second OSC on the Serge set up the above Patch. Use the second OSC's SINE output to IN-2 of the mixer. Slowly turn its associated POT up. A second sound being MIXED with the first should now be heard. The loudness of each of the two sounds can be determined by their associated POTS on the Mixer. Note that you can adjust each OSC's Pitch separately. If you have a third OSC you can patch its TRIANGLE output (or any of its outputs) to IN-3 of the MIXER.

2.5 When a single piano note is struck the sound quickly gets loud and then slowly dies out (if the pedal is down). Try getting this effect by turning the Mixer's pot quickly to the right and then slowly back to the left.

STEP THREE



OR



3.1 The Variable Q VCF and the Variable Slope VCF are both filters and differ only in some of the functions available on them (VCF stands for Voltage Controlled Filter). Either one can be used for this Patch, although in this text we will be referencing the Variable Q VCF. If you are using the Variable Q VCF, set the VCO POT full left and the GAIN POT Full Right. If you are using the Variable Slope VCF, input should be to IN-1 and the MIX POT should be full left. VC SLOPE POTs should be set full left. Connect the output from the VCF's LO jack to the Output module.

3.2 Turn the PITCH POT of the OSC to about 9 o'clock, which will produce a fairly low sound. The GAIN POT on the Mixer should be at the level that it had been adjusted in the previous step.

3.3 Turn the FREQ knob on the Filter all the way right. You should hear a buzz similar to the one in the previous steps.

3.4 Slowly turn the FREQ POT on the Filter to the left. The sound should get softer and softer and finally disappear. However, it will get softer in a different manner than when the Mixer's POTs were turned down. This time, the sound seems to get more and more muffled. The high buzz in the sound disappears first, and then the rest of the sound. Try OSCs set to different FREQs, Different outputs of OSCs (SAW, TRI, SINE), and a Mixer output. When listening to these sounds start with the Filter's FREQ POT set full right in order to hear the full sound before filtering it.

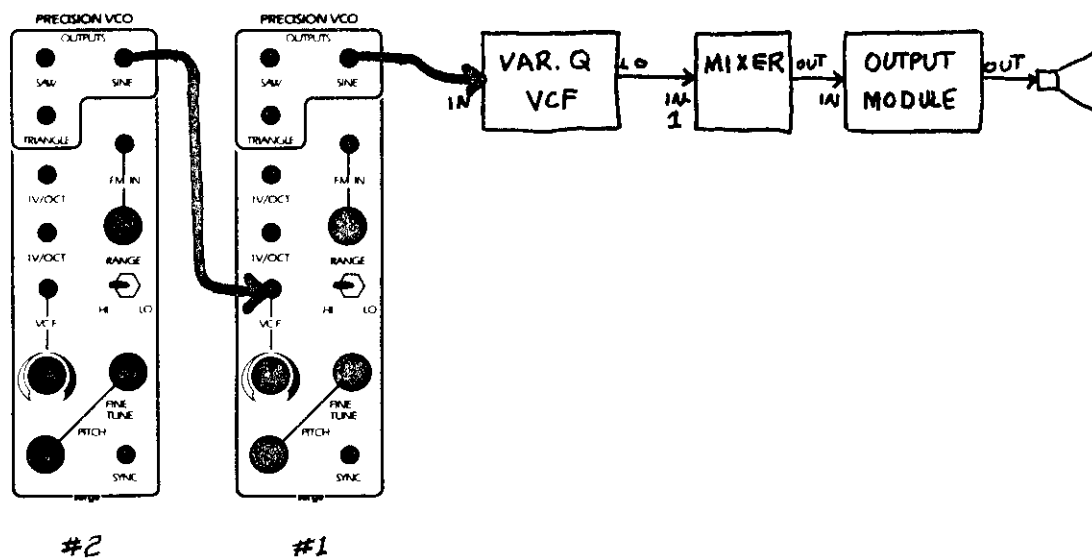
3.5 Try the same Patch but using the BAND output of the Filter. Try the HI output of the Filter, but start with the FREQ POT full left.

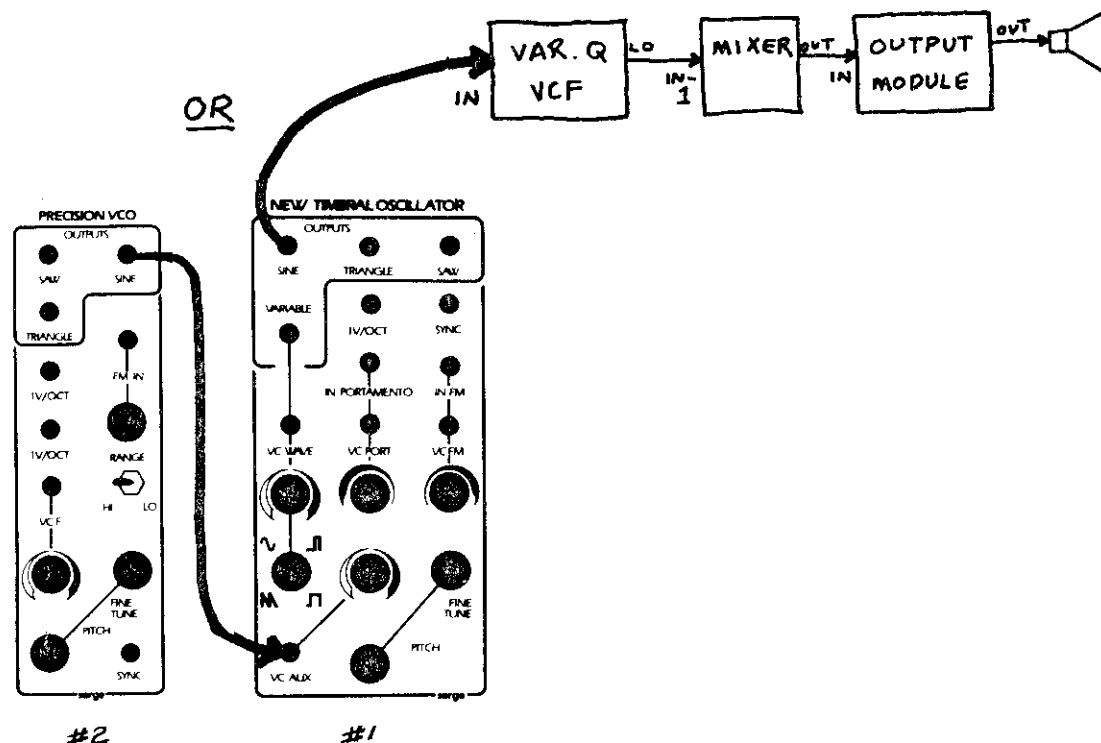
3.6 It should be clear that there are a lot more POTs to turn and adjust than there are hands to turn them. It should also be clear that the sounds so far produced are still very simple and hardly music. These two problems are attacked in STEP FOUR.

STEP FOUR

Certain things about STEP THREE can be easily said. The PITCH POT on the OSC controlled how high or low the frequency of the sound would be, while the GAIN POT on the Mixer controlled how loud or soft the sound would be. The Filter controlled certain aspects of the timbre or quality of the sound.

Loudness, Pitch and Timbre are all components of a single sound. Even in traditional scores these three "parameters" are notated.





4.1 Set up the above Patch using a Precision Controlled VCO in combination with the OSC already being used. If the OSC that you had been using is a Precision Controlled Oscillator, then the new OSC should be patched to the VCF jack. If the OSC in use was a New Timbral Oscillator, then the Precision Controlled VCO should be Patched to the VC AUX jack. The new OSC will be referred to as OSC #2.

4.2 On OSC #2 switch the HI/LO to LO and turn the PITCH POT full left. On OSC #1 either the VC AUX POT or the VCF POT (depending on which OSC. is being used) should be turned right to about 3 o'clock.

4.3 Set the PITCH POT of OSC #1 to about 9 o'clock; set the GAIN POT of the Mixer to a comfortable volume. Set the FREQ POT on the VCF full right (use LO output). The Pitch of the output will start to rise, getting higher and higher. It might get so high that you will not be able to hear it. Then suddenly the sound will drop to a very low sound and start rising again. It is JUST AS IF you were turning the PITCH POT of the OSC slowly to the right and then suddenly, fast as light, turning it full left.

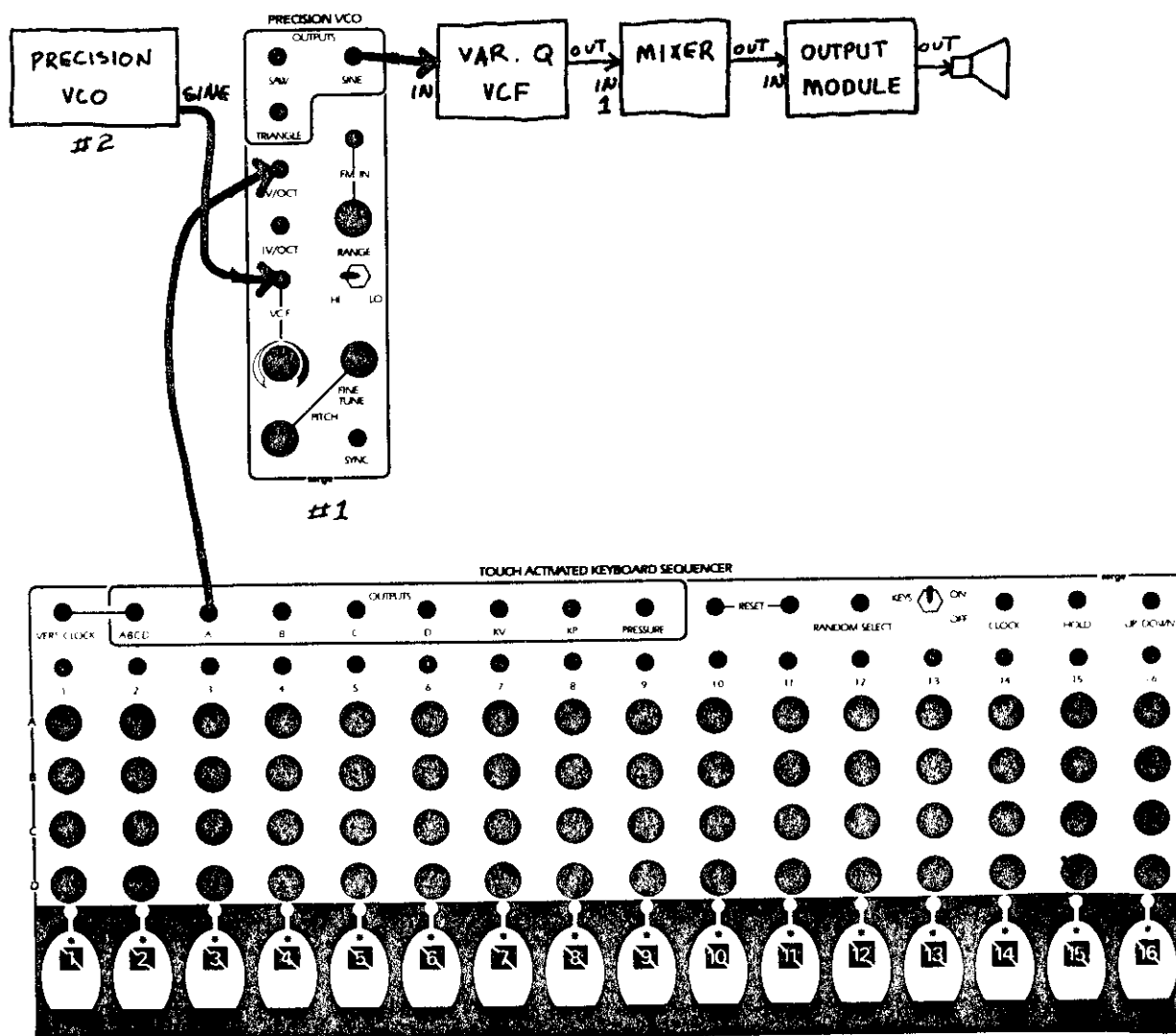
4.4 Slowly turn the PITCH POT on OSC #2 to the right. As you do this the speed at which the pitch rises should increase. As this rising and falling accelerates to more than once a second, the ear starts to hear it as a constant wavering sound. When it approaches 20 times per second, the ear no longer distinguishes individual sweeps (though they are still happening), but rather hears a new, very low sound as well as some strange higher sounds. Turn the PITCH POT on OSC #2 higher and higher listening to results as you do so. Try switching OSC #2's HI/LO switch to HI and sweeping the PITCH POT to the left. Experiment with changing the PITCH POT of OSC #1.

4.5 Return OSC #1 and OSC #2 to the settings at the beginning of this STEP. Try using the SINE out and then the TRIANGLE output of OSC #2. When the SINE out is used, instead of sweeping up and then suddenly falling back down, the sweep is a gentle one both up and back down. With the TRIANGLE out the sweep should be similar to the SINE out except a little sharper at the top and the bottom. The TRIANGLE wave will also go higher than the SINE, and the SINE will make the output sound go below the initial setting of the PCO. Try these two other outputs with different POT settings on both PCO #1 & #2.

4.6 Re-set OSC #1 and #2 to the settings at the beginning of this STEP. Slowly turn the VCF POT or the VC AUX POT from its 3 o'clock setting to its 12 o'clock setting. The sweep will take as long, but won't get as high or drop as low. At 12 o'clock there should hardly be any sweep at all. As the POT is turned past 12 o'clock to 9 o'clock the sweep should start heading DOWNWARD, jumping UPWARD just the opposite of what it had been doing.

STEP FIVE

5.1 Set the Patch in the previous step. Set the VC AUX or the VCF POT of OSC #1 to 12 o'clock so that there is almost no sweeping and so that the sound is neither muffled nor too soft. The FREQ should be set around 11 o'clock.



5.2 Locate the TOUCH ACTIVATED KEYBOARD SEQUENCER (or TKB as it will be called from now on) which is normally at the bottom of your synthesizer and fills an entire panel.

5.3 At the top of the TKB find a switch labelled "KEYS" and turn it "ON".

5.4 Beneath this upper section there are 4 ROWS and 16 COLUMNS of POTS. The Rows are labelled A-D and the columns are numbered 1 to 16. Set the POTS in Row A to 16 different positions--it doesn't matter what positions these are so long as they are all different.

5.5 At the top of the TKB you will find the output section. It contains a number of different outputs including ABCD, A, B, C, & D. Patch from A to 1V/OCT in OSC #1 as in the above diagram.

5.6 Touch the different keypads at the bottom of the module with your finger. As you do, notice that a little light that goes on on the pad you have touched. The light remains on until you have touched another key, so only one light will be on at a time. This light indicates that the column above it is ACTIVATED. The pitch of the sound should change as each pad is touched.

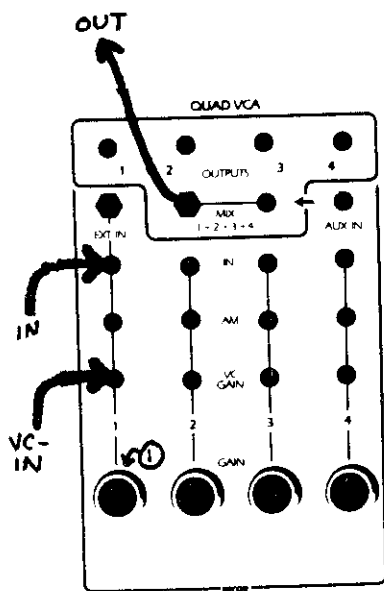
5.7 Turn the pot in the A Row in the column that is now activated (i.e. has its light lit). It should be just like turning the PITCH POT of the OSC #1, but BY REMOTE CONTROL.

5.8 Try setting the POTS in Row A so that a tune can be played on the keypads.

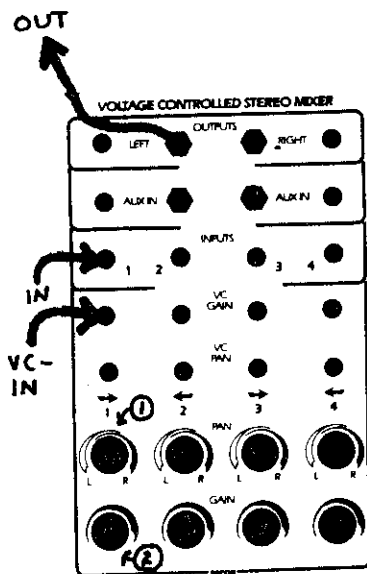
STEP SIX

6.1 Just as an oscillator's frequency can be made to rise or fall by remote or Voltage Control (that is without turning that oscillator's Pot) there are a number of mixers and other modules on the Serge which can control the GAIN of a sound by voltage control. The volume can thus be increased or decreased without turning a pot. In general these modules are called Voltage Controlled Amplifiers (VCAs -- or sometimes: GATES) when they have single inputs, or Voltage Controlled Mixers when they have more than one input.

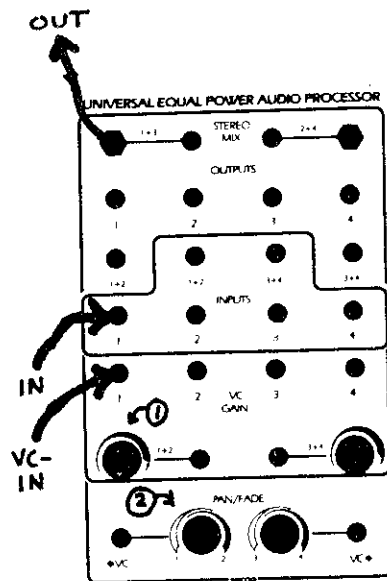
6.2 Almost all the Output Mixers in the Serge System are voltage controllable, meaning that the Gain of their inputs can be controlled by a voltage coming from another module. Each input to the mixer has one or more VC inputs. Below are noted the VC inputs for the various Output Mixers. These will be noted as "VC-IN" on the Output Mixer module.



① 11-12 O'CLOCK

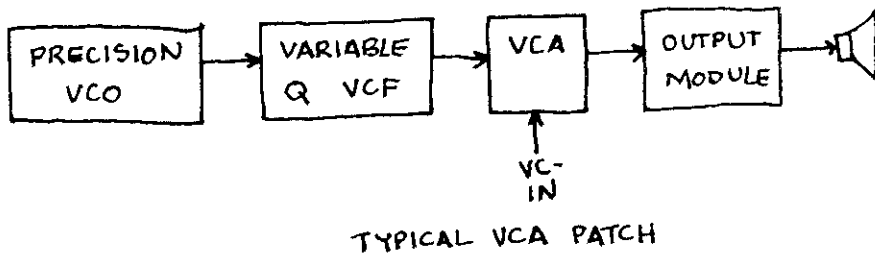
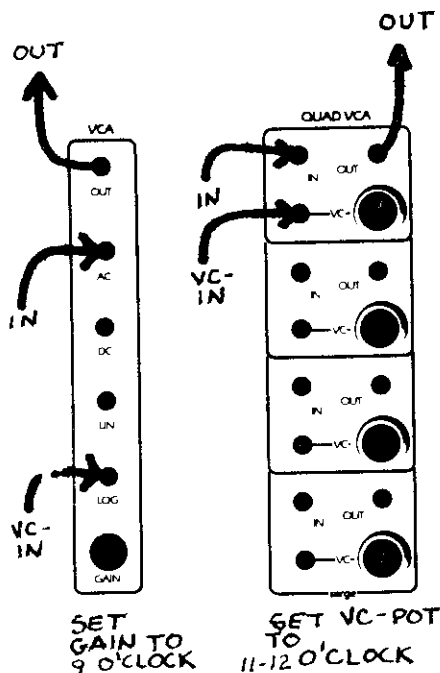


① FULL LEFT
② 11-12 O'CLOCK



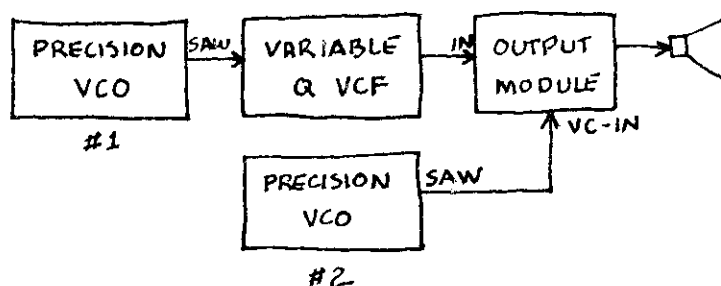
① 11-12 O'CLOCK
② FULL LEFT

6.3 Some Serge Systems have independent Voltage Controlled Amplifier modules which often contain extra features. Patched as another link in the synthesis chain they can be used instead of the VC-output mixer to provide voltage controlled gain. In the diagrams below the VC-IN is noted on these modules. In the patches that follow, the VC-IN will be shown to the Output Mixer, but it can refer to these independent VCAs as well.



TYPICAL VCA PATCH

6.4 In the following patch the PCO which is connected to the VC-IN of the mixer should be set "LO" and its FREQ turned to the left. It will increase and decrease the GAIN (loudness) of the sound in the same fashion that it controlled the frequency of the other oscillator in the previous patches:



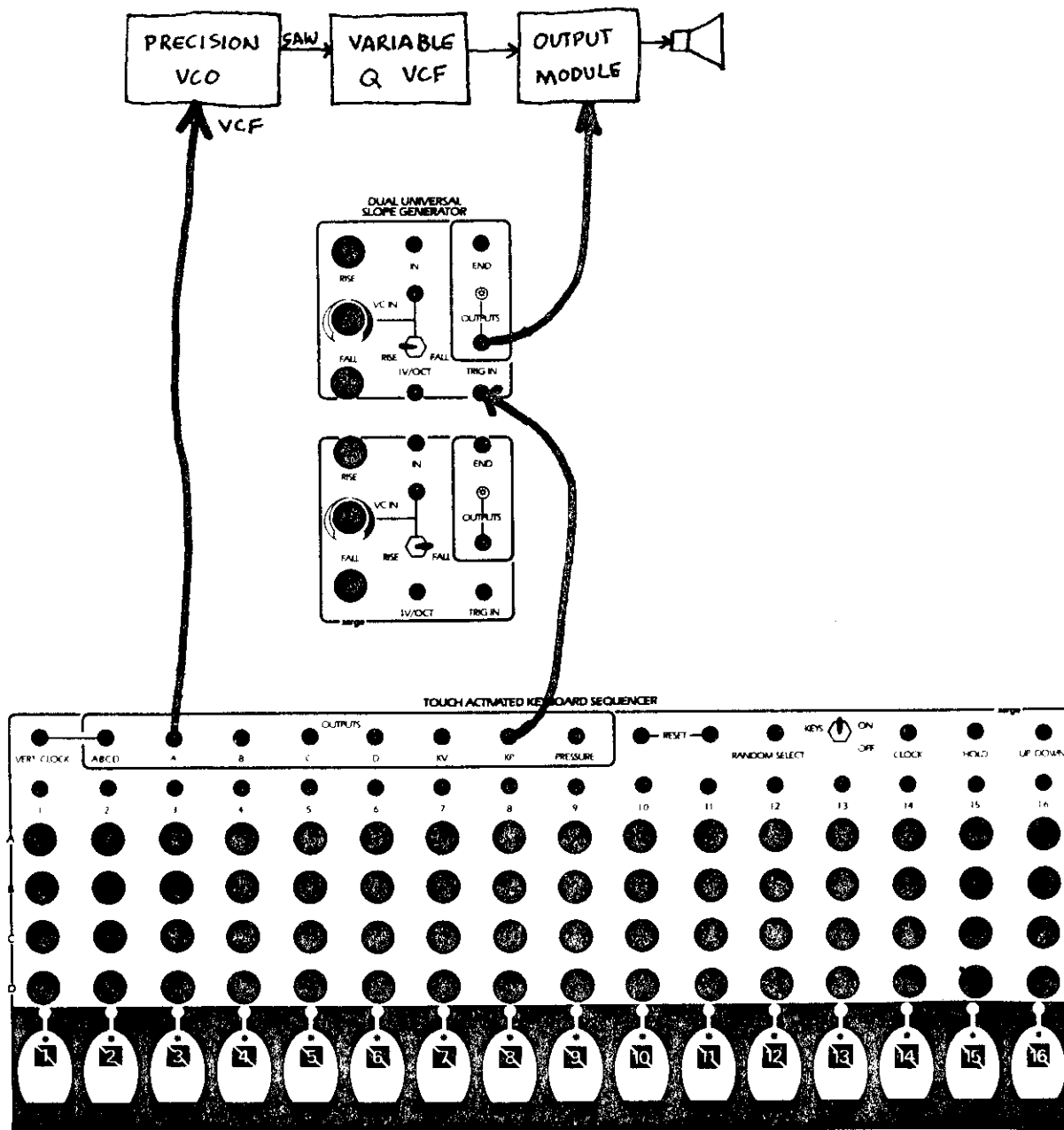
#1: FREQ POT 11 O'CLOCK; SWITCH HI

#2: FREQ POT FULL LEFT; SWITCH LO

6.5 Try increasing and decreasing the frequency of the controlling PCO. The bursts of sound should get faster and slower. Also try using different outputs of the PCO (sine, triangle, saw) and listen to the different "shapes" of the bursts. This shape is called the "Envelope" of the sound.

6.6 The Dual Universal Slope Generator (DSG) is a dual module with two identical modules in it, one above the other. For this patch the upper one will be used.

6.7 On the output section of the TKB find the jack labelled KP (Key Pulse) and patch it to the TRIG IN of the DSG. The A output of the TKB will control the frequency of the PCO as in previous patches. The output of the DSG should be patched to the VC-IN of the output module.

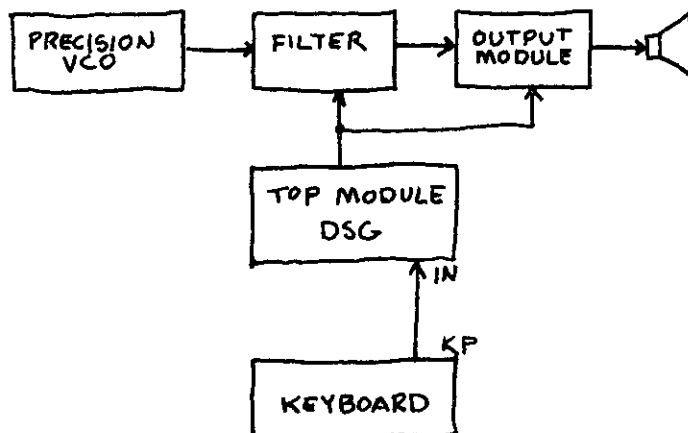


6.8 In this patch the DSG produces a single envelope, unlike the PCD, which produced a continuous stream of envelopes. Furthermore it will produce this envelope on demand, in this case whenever a key is touched on the TKB. In this sense the TKB is controlling the DSG. The length of the RISE and FALL times of the envelope are controlled by the RISE and FALL pots on the DSG. To produce the approximate envelope of a piano set the RISE pot to 1 o'clock and the FALL to 9 o'clock.

6.9 It is possible to get a somewhat "backward" feel to the sound by reversing the settings of the two pots. It is also possible to get very long envelopes or envelopes so short that they sound like nothing more than clicks.

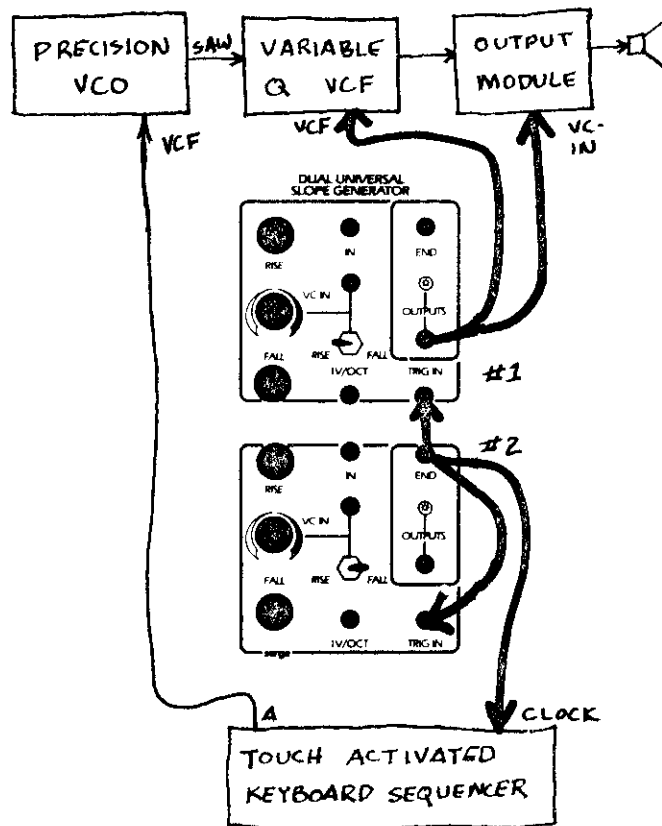
6.12 Tap a key. The sound should now approach very closely the sound of an acoustic instrument. Like the oscillator and the MIXER, the Filter is now being controlled. Not only does the sound get softer and softer as it dies away (from the action of the Mixer), but it should sound as if it is being damped, or losing its "highs" as time progresses. This is what happens when a piano note is struck.

6.13 In the following patch all remains the same as the above patch except that the KP is now connected to the black IN jack of the DSG.



What has been added here is the ability to hold or sustain a sound by keeping one's finger down on the keyboard. The RISE will begin as soon as the key is touched, but the FALL won't begin until the finger is released.

STEP SEVEN



7.1 Using the lower module of the DSG, which will be referred to as DSG #2, patch from the END jack to the TRIG IN jack of the SAME module. This will be the first time that you patch between two jacks of the same module.

7.2 Using the LED light on DSG #2 as a guide, set the RISE and FALL of DSG #2 so that the light flashes about once per second or even slightly slower.

7.3 Remove the cord from KP on the TKB to TRIG IN on DSG #1 and Patch it from END on DSG #2 (stacking the plugs) to TRIG IN on DSG #1. Also stack a patch cord from the END on DSG #2 to the CLOCK jack on the TKB. (Again, note that we are stacking at the output. No input has more than one output connected to it, but the output of DSG #2 is milted to two places, the TRIG Input of DSG #1 and the CLOCK Input of the TKB.)

7.4 The TKB should now begin to "sequence" all by itself, stepping through its columns as if you were touching one keypad after the other.

7.5 Try turning the RISE and FALL pots of DSG #2 further and further to the right. The TKB should step even faster. You may have to adjust the RISE and FALL POTS on DSG #1 to the left to keep the sounds from "blurring" together. Try turning the POTS on DSG #2 farther and farther to the left to make the TKB step slower.

7.6 The PATCH that you have now set up is one of the most common PATCHES on a synthesizer, yet it is but one of an infinite variety. To this PATCH other modules may be added that change the timbre, that create complex rythas, that add second, third and fourth voices. From this first section it is hoped that you have gained some sense of the sounds that a synthesizer can create and to some degree how it creates them. In the following section the theory of synthesis will be explored.