

**Serge Modular Music Systems
572 Haight Street
San Francisco, California
94117**

N VOICE CONTROLLER (NVC)

**** HARDWARE ****

The Serge N Voice Controller is a monophonic and polyphonic controller for use with the modular synthesizer. Control voltage and gate outputs are provided for 1, 2, 4, 6, and 8 voice operation, with additional triggers for 1 and 2 voice operation with ADSR type envelope generators. The module contains an 8-bit micro-processor which decodes the internal digital signals from the Casio electronic keyboards, converting them to control voltages, gates, and triggers for the synthesizer. The hardware for the controller consists of a micro-processor PC board with a small amount of read/write memory and a pre-programmed ROM. An 8-bit Digital-to-Analog Converter is driven by the micro-processor to produce the 1 volt per octave control voltages (CV's), and a set of buffered latches drive the 5 volt positive gates and triggers.

Digital signals from the Casio keyboard are sent from a multi-pin connector to the N Voice Controller. Eight outputs for control voltages are sent to the blue front panel jacks. Gates and Triggers appear at the red jacks, and LED's adjacent to the gates and triggers show the activity of these signals. Three switches on the module provide for Resetting the unit, tuning SELECT, and switching voice MODES.

**** CASIO MODIFICATIONS ****

Also included with Casio model 202's modified by Serge Modular are three extra switches on the left side of the keyboard.

1. The top switch is an Octave Drop switch which will lower the pitch of all the internal voices of the Casio by one octave as well as lower the pitch of the synthesizer oscillators connected to the NVC outputs by one octave (one volt drop in CV at all 8 blue jacks).
2. The middle switch is a different type of Sustain function than that obtained with the Sustain switch or Sustain pedal on the Casio.
3. The bottom push-button switch is a Silent Voice Select which works just like the SET switch only a note is not sounded when the voice is selected.

**** POWER SUPPLY REQUIREMENTS ****

The N Voice Controller requires the standard +12 and -12 volts from the Serge power supply as well as a +5 volts for the small computer board. The +5 volt supply should deliver about 300 ma of current and is connected to the green wire in the power supply cable (+12 volts = red, -12 volts = white, and ground = black). This supply is included in all Systems assembled by Serge Modular, but is not included with singly ordered N Voice Controller modules. A trade-in of good condition standard Serge Power Supply can be arranged for the newer supply with +5 volt output.

**** CALIBRATION ****

The N Voice Controller is adjusted before leaving Serge Modular, but its calibration will vary if the power supply voltage varies slightly. For this reason, the oscillators may not track properly. To adjust the NVC for one volt per octave at all outputs, open up the panel to access the PC board. There is only one trimmer resistor. Using two oscillators, connect the output of CV jack #8 to the one volt per octave input of one of the oscillators, and leave the inputs of the other oscillator unconnected. While monitoring the Sawtooth wave outputs of both oscillators, hit the lowest key on the Casio (low C) with the octave switch in the low position. Tune both oscillators to the same pitch. Then hit the C an octave up, and adjust the trimmer for a perfect octave interval (minimum "beating" between the two oscillators). Play the low C again, and re-adjust the pitch control of one of the oscillators for a perfect unison again. Hit an octave up, then two octaves up and adjust the trimmer for perfect tracking. Go back and forth if necessary.

**** POWER UP ****

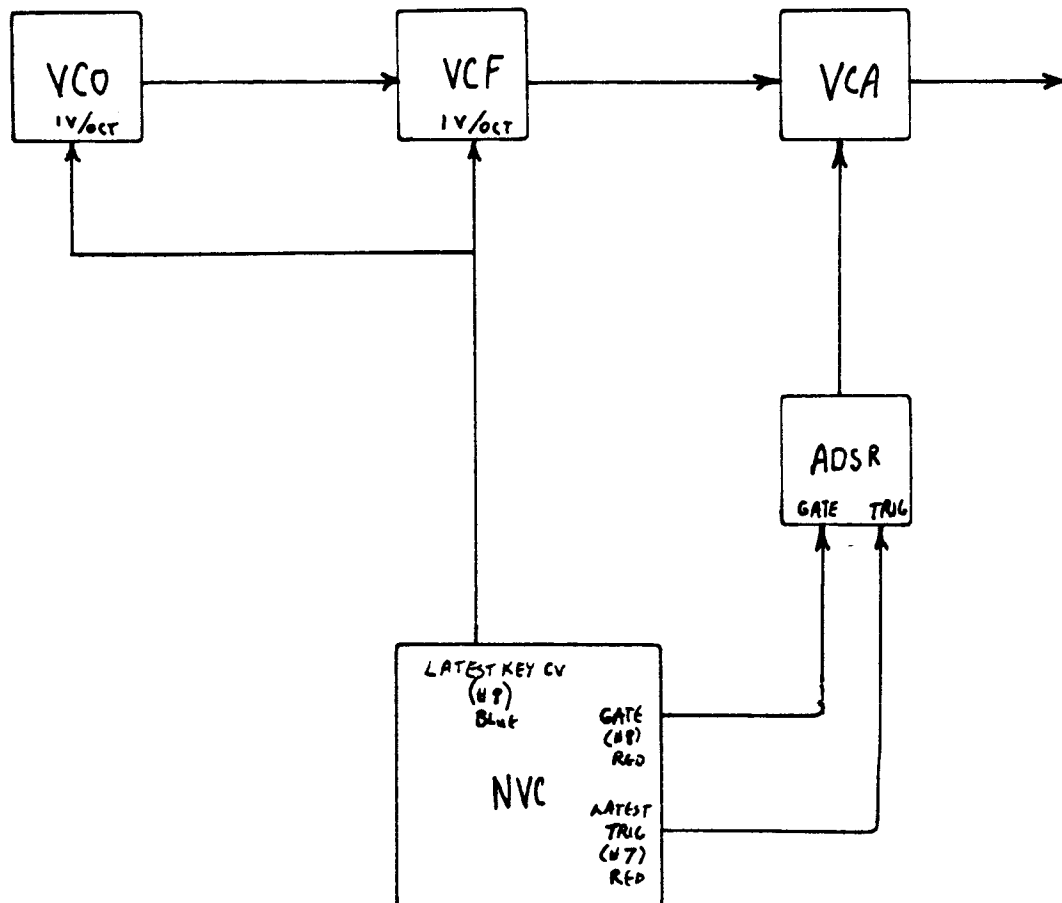
Upon power up, the N Voice Controller must be synchronized to the signals from the Casio keyboard. Normally, this is automatic. The Casio should be switched on at the same time (with a master power switch) or before the Serge unit is switched on so that the N Voice Controller will get synchronized immediately on power up (there is a small delay after power up before the synchronization routine is attempted by the microprocessor). It is possible that if the Casio Keyboard is retuned from the back tuning control, or if it is turned off and on again without turning the Serge modules off, that the synchronizing circuitry will have to be manually reset with the use of the RESET push button.

**** MODES ****

The MODE switch is used to select the number of voices for polyphony. The most useful mode for a small system is the 4V position which selects 4-voice polyphony as well as 4 individual monophonic voices. The four-voice outputs are the top four CV jacks and GATE jacks. If four keys are depressed, all four Gates will go high, and the voltages at the four CV jacks can be used to control VC Oscillators, VC Filters and other modules in the synthesizer (see four-voice patch).

**** MONOPHONIC - LATEST KEY LOGIC ****

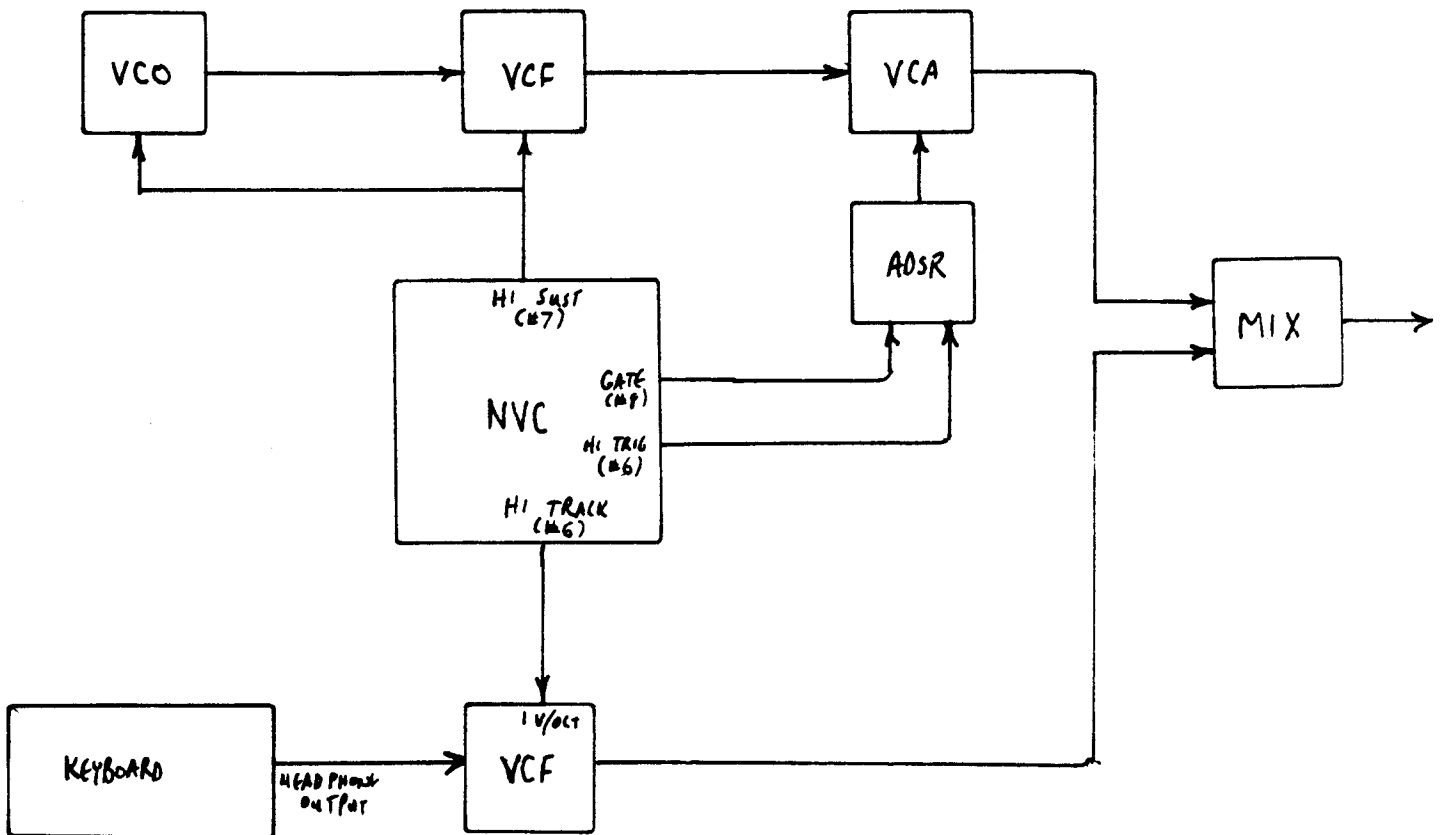
With the MODE switch in the down position, the lower blue jack, #8, is a CV output corresponding to the value of the LATEST KEY. When connected to the one volt per octave input jack on an oscillator, the pitch of the oscillator will follow the latest key played. Here is the standard keyboard synthesizer patch for a monophonic mode. This is only one of many possible patches that are possible with a modular system, of course, and it is shown here so that you can become familiar with the operation of the N Voice Controller, not as the definitive patch for its use.



**** MONOPHONIC - HIGHEST SUSTAIN LOGIC ****

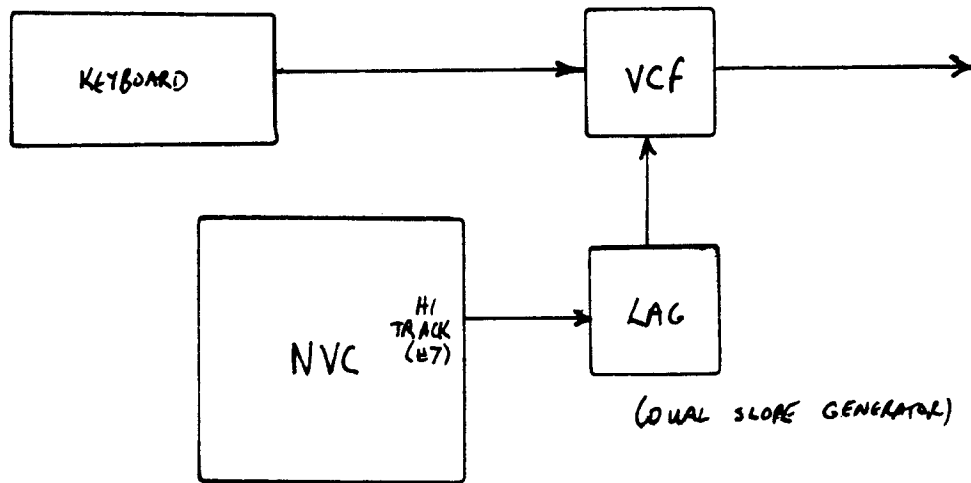
Jack 7 represents a voltage corresponding to the HIGHEST KEY played. This output has "memory", in that if other lower keys are being sustained, this output will not jump down to the lower keys when the high note is released. This allows the unit to be both a monophonic solo synthesizer and a polyphonic synthesizer at the same time. In this instance the HIGHEST KEY logic is used, but any of the other monophonic outputs can be used (as described below) for different types of polyphonic/monophonic effects.

The audio signal from the Casio keyboard is used to provide the polyphonic tones, and the HI SUST output is used for the solo voice. The GATE output (red jack #8) and the HI TRIG output (red jack #6) are used to initiate the envelope of the ADSR module. An interesting variation on this patch is to filter the sound of the polyphonic Casio keyboard through a VC filter:



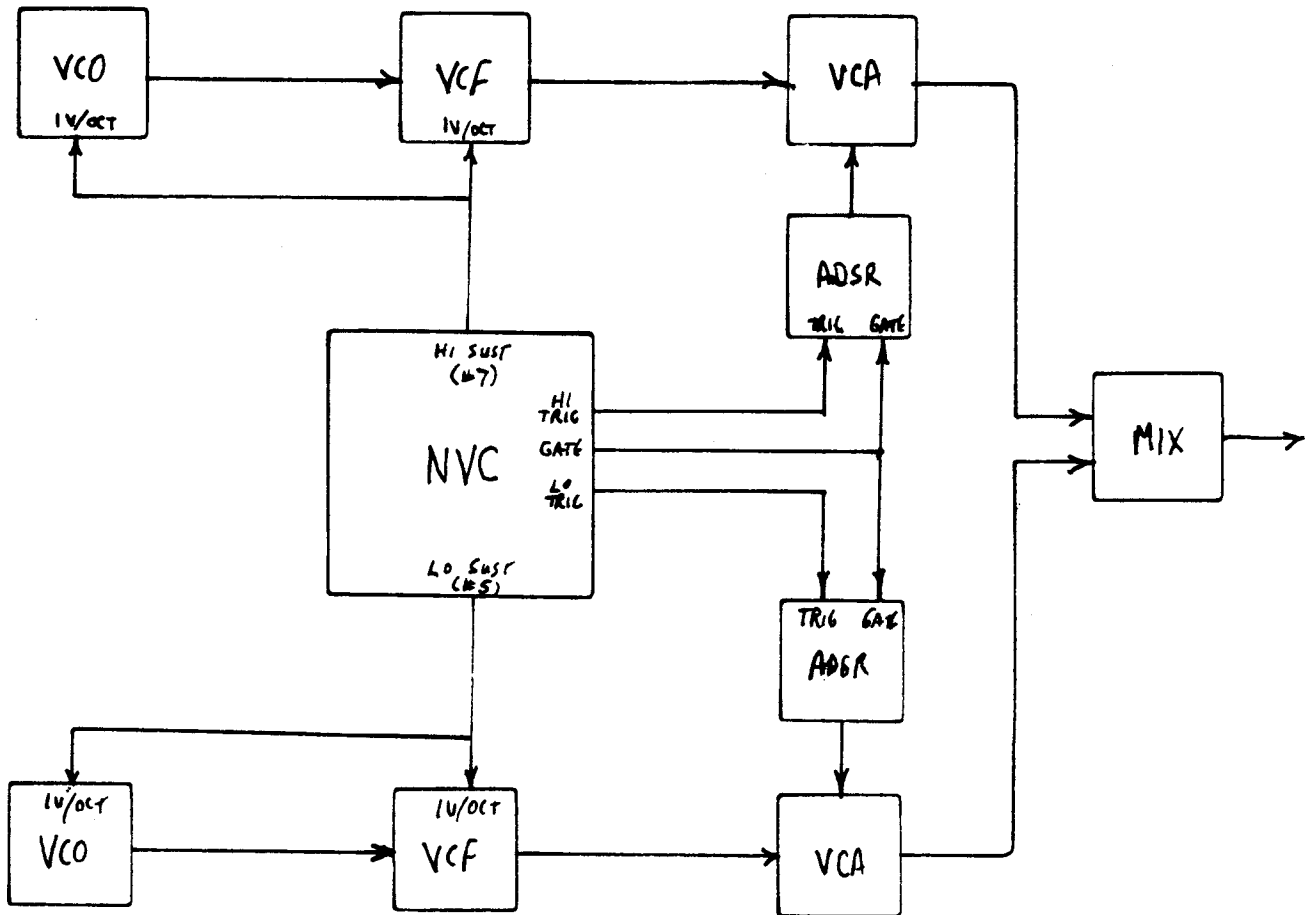
**** MONOPHONIC - HIGH TRACKING LOGIC ****

The #6 blue jack, HI TRACK is similar to the HI SUST output, but it does not have the memory feature, so this voltage always corresponds to the current, highest key depressed. In the patch below, this jack could be used to control the VC filter for the Casio signal. An interesting effect is to add "lag" to this signal to get slowly changing filter effects:



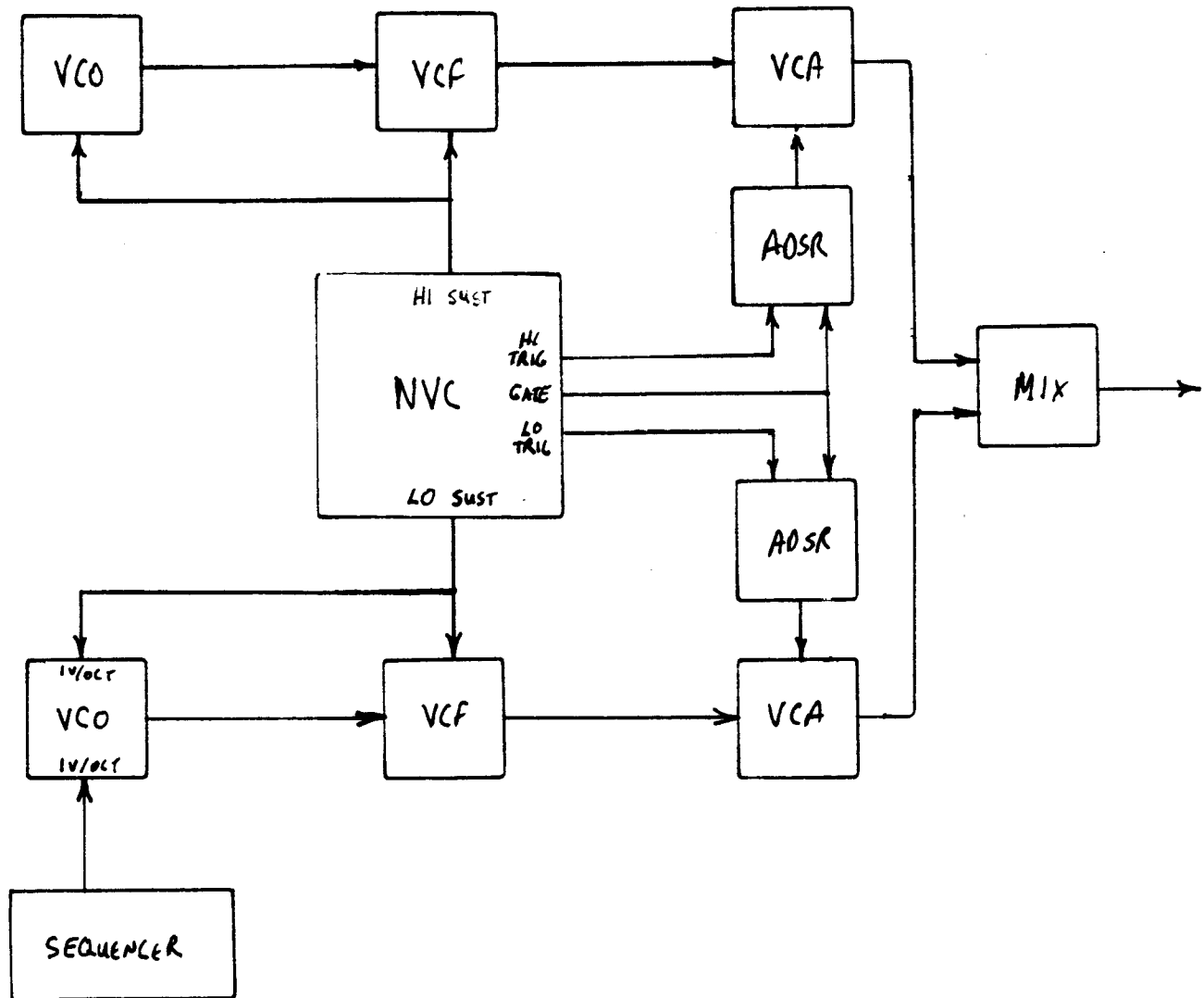
**** MONOPHONIC - LOW SUSTAIN LOGIC ****

Like the HI SUST output, there is a symmetrical LO SUST output on jack #5 with similar logic, only using the lowest key depressed. Red jack #5 provides the LO TRIG for and ADSR for the low voice. A two voice patch might be connected like this:



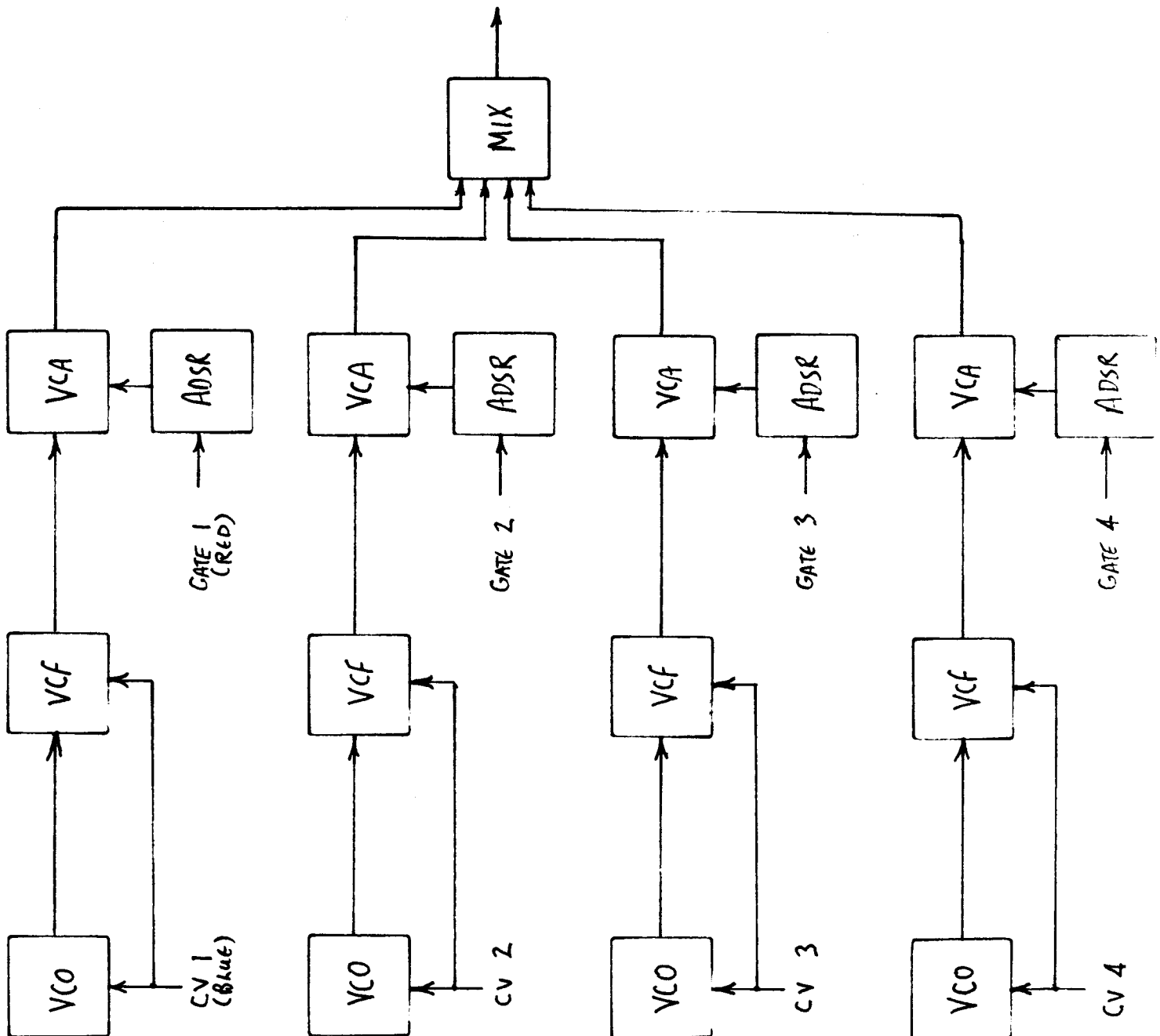
Note that both ADSR's use the same GATE, since the GATE will be high whenever any key is played. But separate triggers are necessary to re-trigger the envelope while latest, higher or lower keys are selected.

Here is a patch using the lower voice to control the transposition of key of a sequencer, while using the high voice to play a solo line:



**** POLYPHONIC MODES ****

The four, six, and eight voice modes of operation are mainly intended to be used with a synthesizer that has multiple voice capability. Normally this means at least one oscillator (usually two), one VC filter, one VCA and one or two envelopes per voice. The simplest 4-voice synthesizer requires four oscillators, four VC filters, four VCA's, and four envelope generators. Of course there are other patches which could make use of the multiple voice capability. The four-voice mode is present at the top four jacks pairs (CV's, blue... GATES, red) when the MODE switch is in the down position. The middle position of the MODE switch selects 6-voice operation (top 6 jack pairs...latest key CV, highest key CV, mono GATE and latest Trigger are still present on jacks 7 and 8). In the up position of the MODE switch, the NVC is set for 8-voice operation with 8 CV's and 8 GATE outputs. Here the basic N Voice (in this case 4-voice) patch:



**** TUNING SELECT ****

The SELECT switch is most useful for tuning multiple oscillators in a four to eight voice mode. When the SELECT switch is set to the middle position, all eight blue jacks will be set to 2 volts and the GATES will all go high so that oscillators can be tuned to unison. The top position of the SELECT switch will send 4 volts to all eight jacks to allow you to "fine tune" the oscillators when they are set another two octaves up. The SELECT switch must be off (down) to use the keyboard.

