PROGRAMMER

OPERATIONS

MANUAL

PROGRAMMER OPERATIONS MANUAL

1.0 Operation

The Model 700 Programmer consists of two envelope generators and three general-purpose voltage sources, all of which are connected to the synthesizer that is going to be controlled. Envelope 1 should be connected to the VCA, and Envelope 2 should be connected to the filter control input. The voltage sources are usually patched to three VCOs. The 700 also requires a gate signal. A switch trigger (Moog), or a gate and a trigger can also be connected when available. More detail for connection to individual synthesizers is contained at the end of this manual.

1.1 Memory Selection

There are eight PROGRAM SELECT pushbutton switches that select one of eight different programs. When selected, the corresponding LED indicator on the switch will light. The MEMORY BANK rotary switch can select one of eight different memory banks. Each memory bank contains a different set of eight programs; hence 64 (8 x 8) different programs can be selected at any time. The current bank and program numbers are displayed on LED numerical displays for quick reference.

The current program can also be changed by an external signal input to the PROGRAM INCREMENT socket. The footpedal provided can be connected to this input, so that each time the footpedal is hit, the program will increment. Any other general-purpose pulse of sufficient duration (greater than 10 milliseconds) will also increment the program when connected to the PROGRAM INCREMENT. This input is de-bounced so that relatively noisy signals can still be used. The maximum frequency that can be used is approximately 20 Hz. The EDGE switch selects whether to increment the program on the rising edge of the signal (⌐) or on the trailing edge of the signal (⌐). The SEQUENCE LENGTH rotary switch is used to select how many programs to cycle through before resetting to program 1. That is, if the SEQUENCE LENGTH is set to 3, the program will cycle 1-2-3-1-2-3-1 etc. with each new pulse. When in the OFF position, the incoming pulses will be ignored, and no incrementing will take place. The pushbuttons are still active at all times, regardless of external pulses or the setting of the SEQUENCE LENGTH switch.

There are many different signals that can be used to increment the program to generate interesting effects. A keyboard gate can be used, which would change the program on each new key hit. Sequencers (such as the Sequential Circuits Co. Model 800) can be used to advance the program at the end of a sequence (the Model 800 requires the use of a special cable, # 830, to connect to the programmer). The gate output of a sequencer could also be used to cause more changes. An LFO could be connected to the PROGRAM INCREMENT, which would cause the programmer to act as a 3 x 8 sequence with envelopes (try it some time).

1.2   Mode Selection

The current mode of the programmer is selected by the RECORD / VARIABLE / PLAYBACK switch. When in VARIABLE, the front panel controls on the programmer are active. When in PLAYBACK, the front panel controls are ignored, and the programmer is controlled from memory. RECORD is a momentary position used to store the current panel settings into the currently selected MEMORY BANK and PROGRAM SELECT memory position. The RECORD position was designed to be hard to push to avoid accidental erasing of programs. Remember that whenever the RECORD switch is pushed, the current program will be erased and re-programmed with the current front panel settings. Be careful not to destroy the wrong program.

The memory in the programmer is non-volatile, meaning that it retains its information even when power is removed. This means that once a program is stored, it will always be there, no matter what happens to the programmer. There are three penlight batteries that keep the memory active when AC power is removed. The life of these batteries is equal to the shelf life, meaning that they should last a year or two. We recommend that you replace them yearly, rather than waiting for the memory to start failing. To replace the batteries, remove the four screws holding the back plate on the programmer. The three batteries are in plain view in a battery holder. Replace the three batteries with alkaline batteries for better performance, and tape them down in the same manner to avoid loose batteries. They can be replaced with the AC power connected and turned on to avoid losing the current content of the memory. If you do this, be extremely careful of the AC power present above the battery holder by the transformer, power switch, and fuse holder.

1.3   Envelopes

The two envelope generators in the Model 700 Programmer have more functions than most synthesizers offer, which expands the capability of your synthesizer. Each envelope consists of five controls: DELAY, ATTACK, DECAY, SUSTAIN, AND RELEASE. The envelopes are initiated by the particular gate, gate-trigger, or switch trigger system being used. The following page shows graphically the

operation of the envelopes based on the different input controls possible. The overall operation of the envelopes is very close to that on your synthesizer.

Both envelopes also have an AMOUNT control that defines the gain of the envelope. The envelopes have a 13-volt peak when the AMOUNT is all the way clockwise, and is reduced from there. On envelope 1, this will operate as a overall volume control. On envelope 2 (filter control) this will have the effect of an "amount of envelope" control. Envelope 2 also has an OFFSET control, which is simply a DC voltage that is added to the envelope. The OFFSET is not controlled by the AMOUNT control. It has the function of acting as an "initial cutoff frequency" control. Both AMOUNT controls and the OFFSET control are remembered as part of the program.

1.4   Voltage Sources

The three voltage sources are usually used for oscillator control, though they could be patched to any control voltage input on your synthesizer. They have a five-volt range, which corresponds to a five-octave range on your oscillators. The VOLTAGE controls step in semitone steps when turned (quantized), which makes tuning extremely fast and easy. The voltage steps in the programmer are very accurate, but often times the oscillators in your synthesizer may not be. Remember that if your synthesizer is out of tune normally, it will be out of tune with the programmer. Some synthesizers may require that the programmer be tuned to match the synthesizer. This is fairly easy to accomplish. Remove the back panel. There is a trimmer control (black) in the lower right hand corner of the circuit board. This controls the overall gain of the output voltage from the programmer. It can be raised or lower as required for your oscillators to track. The tuning method is as follows:

1) Patch VOLTAGE 1 to one oscillator, and VOLTAGE 2 to a second. (Be sure that you tune your synthesizer according to the manufacturers instruction before performing these adjustments.)

2) Turn both VOLTAGE 1 and 2 fully counter clockwise.

3) On your synthesizer, tune the two oscillators exactly to each other.

4) Tune one oscillator two octaves above the other using the VOLTAGE control on the programmer.

5) Turn the trimmer control on the circuit board of the programmer until both oscillators are in tune, the programmer should now be in tune with your synthesizer.

1.5   External Voltage

Any voltage connected to the EXTERNAL VOLTAGE socket on the programmer can be added to any or all of the voltages, as well as envelope 2. This is handy for external connection of sequencers, keyboards, etc. The ADD EXT switches in each voltage and in envelope 2 select whether or not to add the external voltage. These switch functions are not remembered as part of the program.

1.6   Overall Operation

Once the programmer is connected to your synthesizer, you are ready to start setting up your programs. Place the programmer in VARIABLE mode.
The front panel controls are now active. Play with the settings until you have a sound that you want to save in memory. Now select the memory bank and the specific program that you want to store the sound in. Push the RECORD switch. The program is now stored in that location, ready for recall at any time. It is a good practice to place the programmer in PLAYBACK mode momentarily to verify that the program was remembered correctly. If not, simply push the RECORD switch again. You can now place the programmer in VARIABLE again and set up your second program, and store it in another memory location. Typically you will want to set up sounds that will be used together all in one memory bank, so that switching from one to the other will be fast. During performance, the programmer will be in PLAYBACK mode, and a simple push of a PROGRAM SELECT pushbutton is all that is required to change your synthesizer's sound.

2.0   Programmer Notes

2.1   Occasionally when adjusting one of the front panel controls, you may hear some oscillation of one of the voltages. When this happens, simply continue adjusting the control until it stops. This only will happen in VARIABLE mode, and never in PLAYBACK, so it never should affect your playing.

2.2   Though there are two sets of input sockets for each input to the programmer, only one of each pair can be used at one time. The outputs, however, can both be used simultaneously. There is sufficient drive on these outputs to be connected to multiple functions. Hence, one synthesizer can control a second, though only one keyboard can be used since only one input to the programmer can be used, and both synthesizers will have exactly the same program playing at any -one time.
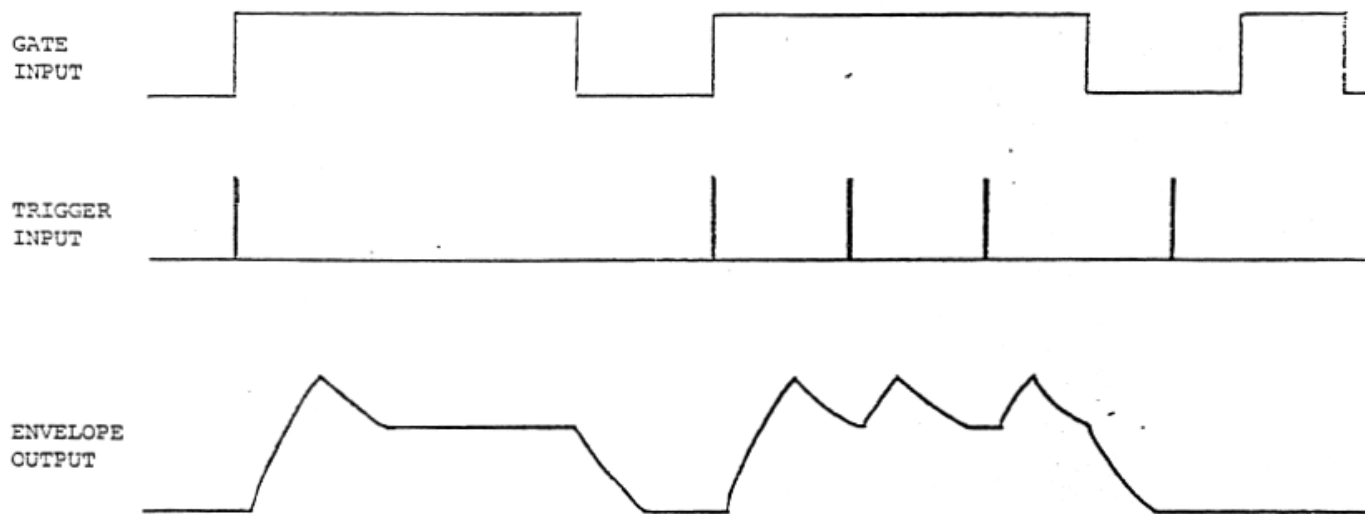
2.3   There is no way that a program can be erased when power is off, so that accidental operation of the RECORD switch when transporting the programmer will not cause any problems.

2.4   The fuse is ¼ amp. Replace it with power off and the AC cord disconnected.

1) GATE ONLY or SWITCH TRIGGER SYSTEM

GATE INPUT

amount

ENVELOPE OUTPUT

sustain

← delay ✕ attack ——— ✕ decay ——→   → release ←
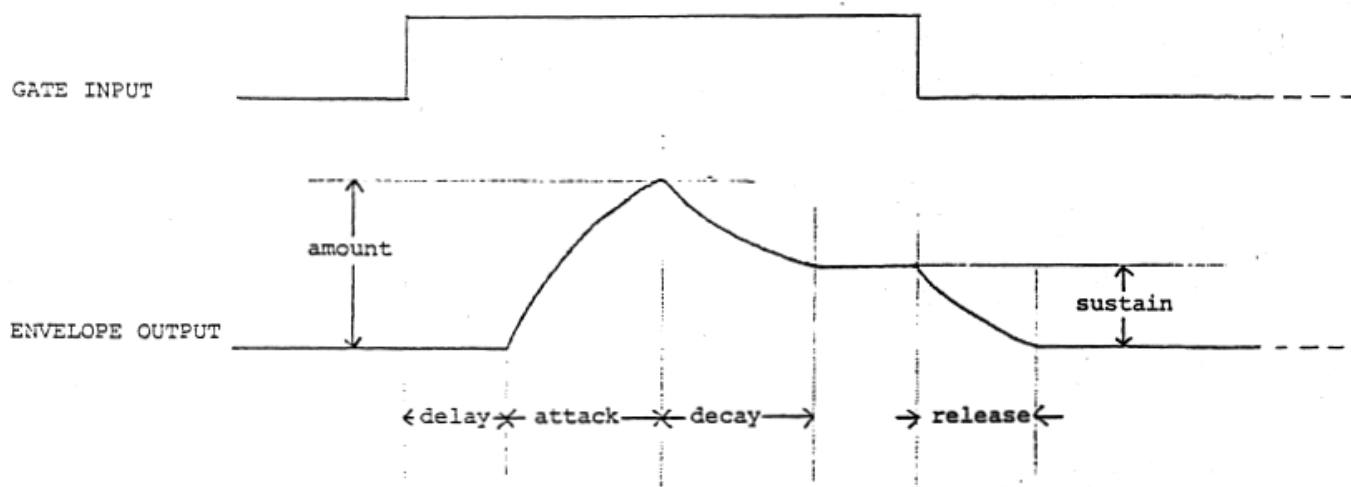
2) GATE AND TRIGGER SYSTEM

GATE INPUT

TRIGGER INPUT

ENVELOPE OUTPUT

3.0 Synthesizer Connections

3.1 ARP 2600

Make the following connections with patch cords between the programmer and the 2600:

PROGRAMMER	2600
GATE	GATE
TRIGGER	TRIGGER
EXTERNAL VOLTAGE	KEYBOARD CV OUT
VOLTAGE 1	OSCILLATOR 1 KEYBOARD CV IN
VOLTAGE 2	OSCILLATOR 2 KEYBOARD CV IN
VOLTAGE 3	OSCILLATOR 3 KEYBOARD CV IN
ENVELOPE 1	VCA ADSR CONTROL IN
ENVELOPE 2	VCF ADSR CONTROL IN

Set the VOLTAGE 1, VOLTAGE 2, VOLTAGE 3, and ENVELOPE 2 switches to the ADD EXT position. Turn VOLTAGE 1, VOLTAGE 2, and VOLTAGE 3 controls fully counter-clockwise, and set the mode to VARIABLE. Tune the three oscillators to the lowest note that you will need. From now on, do not change the tuning of the oscillators on the synthesizer; make all changes from the programmer. Also, do not use the ADSR or AR envelope generators on the synthesizer; use the envelopes on the programmer. You are now ready to start setting up your programs and storing them as required.

3.2   Mini-Moog

Make the following connections with patch cords between the programmer and the Mini:

PROGRAMMER	MINI-MOOG
SWITCH TRIGGER	S-TRIGGER
VOLTAGE 1	OSCILLATOR CONTROL INPUT
ENVELOPE 1	LOUDNESS CONTROL INPUT
ENVELOPE 2	FILTER CONTROL INPUT

To connect the S-trigger, a special phono to Cinch plug cable is required. These are available from Sequential Circuits Co. (# 825).

Set the following controls on the Mini:
  1)   CUTOFF FREQUENCY   fully counter-clockwise
  2)   AMOUNT OF CONTOUR fully counter-clockwise
  3)   LOUDNESS ATTACK   fully counter-clockwise
  4)   LOUDNESS DECAY   fully clockwise
  5)   LOUDNESS SUSTAIN   fully clockwise
 6)   DECAY   switch on

You are now ready to start setting up your programs. Mini-Moogs often require the programmer to be tuned to match exactly, as described in section 1.4. Use the 440 oscillator as the reference for tuning, rather than two oscillators.

When using the Mini in this set-up, the three oscillators cannot be used separately. There is a fairly simple modification that can be performed to Minis to allow access to all three oscillators separately (by VOLTAGE 1, VOLTAGE 2, and VOLTAGE 3). The following procedure is used for modifying the Mini. We suggest that you have a local service man do the changes, or you can ship the unit to us, and we will do the modification for a small fee.

1) Expose the electronics by removing the back metal cover held on by 18 sheet metal screws.

2) Remove both right-hand circuit boards (looking at the rear) and set them aside temporarily.

3) Install two phone jacks to the right of the MAIN OUTPUT HIGH jacks on the back panel by drilling two 3/8-inch holes. The jacks should be the shorting type (Switchcraft 112A). Label one jack as VOLTAGE 2 IN and the other as VOLTAGE 3 IN.

4) Connect a wire from the shorting lug of the VOLTAGE 2 jack to the output lug of the OSCILLATOR CONTROL INPUT jack.

5) Connect a 15-inch wire and a three-inch wire to the output lug of the VOLTAGE 2 jack. Label the long wire at the other end as VOLTAGE 2.

6) Connect the other end of the short wire to the shorting lug of the VOLTAGE 3 jack.

7) Connect a 15-inch wire to the output lug of the VOLTAGE 3 jack. Label the other end of this wire as VOLTAGE 3.

8) Replace the inside board.

9) Refer to the following page for a diagram of the circuit board. Connect the two wires to the board as shown.

10) Replace the second board and the back panel.

BOARD 1 CONNECTIONS
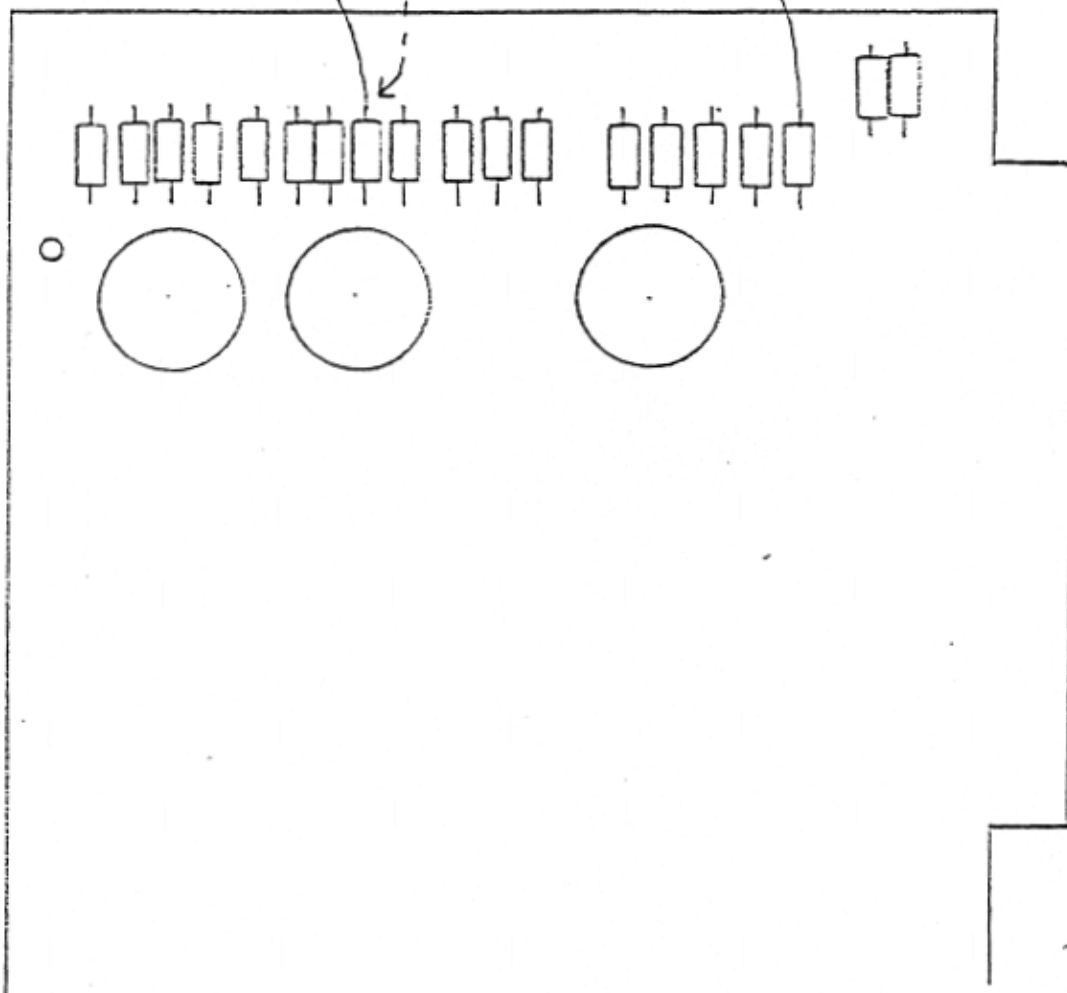
to VOLTAGE 2 jack

lift this end of the resistor
from the circuit board so that
it is no longer connected.
Solder the wire on to this end
of the resistor, bend the lead
out straight, and tape the wire
down for strength. Be sure
that the wire does not touch
the old connection.

to VOLTAGE 3 jack

MODEL 700 "SINGLE PLUG" INTERFACE SPECIFICATION

The new version of the Model 700 Programmer will have, in addition to the normal interface jacks on the back panel, a single, 12 pin connector which contains all necessary interface signals for controlling any synthesizer. When a matching connector is built into another synthesizer by either the manufacturer as part of the unit, or by independent owners or service centres it will be possible to completely interface the programmer with a single patch cord, rather than the many that are now required. The advantages of this approach are obvious.

The type of connectors to be used is from Viking Industries, Inc., (21001Nordhoff St., Chatsworth, CA 91311 (213) 341-4330) specifically their THORCOM line of commercial circular connectors. These connectors are small and low cost, but by using gold-plated contacts, the reliability is very good. Viking also makes custom moulded cables to fit these connectors.

The specific receptacle part number that we will be using in the 700 is a TKR12-1017 that cost about $0.42 in 1000 quantity. The pin contacts that will be used are TP-100AU, costing about $0.08 each in 10,000 quantities. 12 pins will be installed, with one not assigned (spare). These pins are used with a crimp tool, but PC board pins are also available. A custom 6-foot connecting cable will cost about $10.23 in 1000 quantities. This cable will snap lock on the connector for a positive connection (squeezing the connector is necessary for removal.)

The actual pin assignment that will be used is as follows:

Pin 1	GROUND - connected to shield
2	PROGRAM INCREMENT IN
3	SWITCH TRIGGER IN
4	GATEIN
5	TRIGGER IN
6	EXTERNAL VOLTAGE IN
7	VOLTAGE 1 OUT
8	VOLTAGE 2 OUT
9	VOLTAGE 3 OUT
10	ENVELOPE 1 OUT
11	ENVELOPE 2 OUT
12	Spare

Note that for some synthesizers, all of the pins will not be used. These pins can be left out of the connector on the synthesizer as a cost savings, as can pin 12.
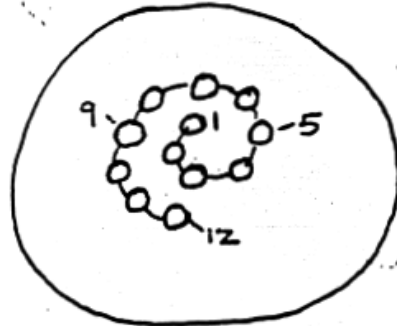
The Model 700 has an isolated ground in its power cord, so Pin 1 should be used as the ground reference for control voltages. For actual definitions of the signals, refer to the Model 700 operations manual. These signals are redundant with the normal back panel jacks, and have identical operation.

The new Model 700 will also have individual scaling trimmers for the three output VOLTAGES, with access holes in the panel. This will allow, in most cases, the ability to do all interface trimming in the 700, without having to adjust the synthesizer. When shipped, they will be trimmed to exactly 1V/OCT
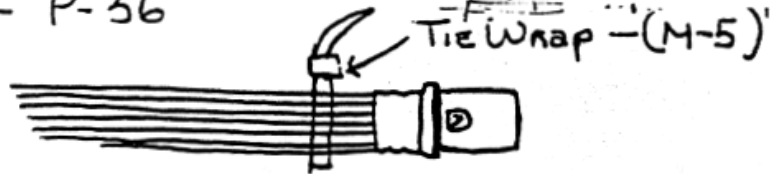
The deliveries of the new Model 700 will start in early 1979.

700 Programmer Wiring (all 22 gauge)

Pin	Color	Lengths
1	Black	2"
2	Orange	7¼"
3	Blue	6¼"
4	Brown	5½"
5	Red	4½"
6	Yellow	2¾"
7	Green	3⅜"
8	Orange	4⅜"
9	Tan	5¼"
10	White	6½"
11	Purple	7"

* Pin Socket (Connector) J-36
* Pins —— P-36

Tie Wrap —(M-5)

Please Splice wire ends

FEMALE

¾"

wire ¾" from insulation to pin beginning of p.

6 ft