

Oberheim synthesizer expander module



INSTRUCTION MANUAL
SYNTHESIZER EXPANDER MODULE

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*****INTRODUCTION*****

The Oberheim Synthesizer Expander Module is a precision electronic music system with a variety of uses. It combines the most often needed circuitry of an electronic music synthesizer in one compact, versatile module. Two voltage controlled oscillators are configured with a four-mode voltage controlled filter, two envelope generators, a low frequency oscillator, and a voltage controlled amplifier. The Synthesizer Expander Module can be used in the following applications:

- With a keyboard to form a small electronic music synthesizer
- To expand the capability of existing synthesizers at low cost
- With systems employing a digital sequencer to allow both the main synthesizer and the sequencer to be played simultaneously
- With polyphonic keyboards to form multi-voice polyphonic synthesizer systems
- As a precision laboratory signal generation and processing device

The various circuits on the Synthesizer Expander Module can be interconnected by potentiometers and switches on the unit's front panel. These interconnections allow many useful synthesizer "patches" to be quickly and easily generated. A multitude of circuit input and output points are available on connectors internal to the unit. Desired patches not possible with front panel controls can often be accomplished by simple wire connections at these internal points. In addition, these internal points can be brought out to external connector jacks and connected to other equipment in a variety of useful ways.

The Synthesizer Expander Module can be configured to be compatible with virtually any existing voltage-controlled synthesizer. Normally the unit is constructed at the factory to accept a nominal one volt per octave control voltage, which is the industry standard, however other control voltage ranges can be accommodated. The unit has provisions for being easily rewired for most known gate/trigger voltage arrangements by means of internal strapping options.

The Expander Module is packaged in a rugged metal case and is self-powered. Oscillator stability is unsurpassed. Due to the unique "piggy-back" printed circuit board construction technique used, the unit is virtually wire free, which enhances reliability and serviceability.

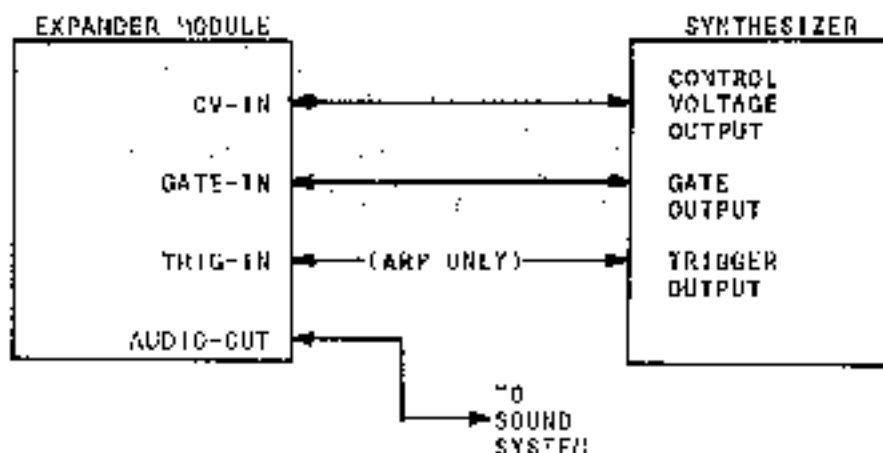
*****FEATURES*****

- Two voltage controlled oscillators (VCO's) with sawtooth and pulse outputs
- VCO frequency and pulse width can be modulated by either an envelope generator, the low frequency oscillator or from an external source
- VCO's can be phase synchronized
- One voltage controlled filter (VCF) with low-pass, band-pass, high-pass or notch response
- VCF frequency can be modulated in either the positive or negative direction by either an envelope generator, the low frequency oscillator or from an external source
- VCF has an integral three-input mixer allowing combination of signals from VCO 1, VCO 2, or either of two external sources
- Two envelope generators with adjustable Attack, Decay and Sustain
- One low-frequency oscillator
- All circuit inputs and outputs are available on internal connectors and can be brought out to jacks for inter-connection to other equipment
- Can be configured to be compatible with virtually any voltage controlled synthesizer
- Unique packaging technique enhances reliability and makes servicing and modifications easy
- Two cascaded regulated power supplies makes unit immune to power line variations

***** INSTALLATION INSTRUCTIONS *****

HOOKUP

To connect the Expander Module to your synthesizer, make the following connections:



CONTROL VOLTAGE ADJUSTMENTS

After the above connections are made, it may be necessary to adjust the Volts/Octave characteristics of the Expander Module oscillators to match the Volts/Octave output of your synthesizer. This is accomplished as follows:

- 1) Play a note three octaves above the bottom note on the keyboard and tune VCO 1 to the same note your synthesizer is sounding, using the VCO 1 FREQUENCY knob
- 2) Play the bottom note on the keyboard and without changing either the Expander Module FREQUENCY knob or the synthesizer's frequency knob, tune the two oscillators together by adjusting the trimmer which is accessible thru the small hole in the control panel.
- 3) Repeat 1) and 2) as necessary to make the Expander Module oscillator track with the synthesizer oscillator
- 4) Repeat 1), 2) and 3) for VCO 2

***** FRONT PANEL CONTROLS *****

VCO 1 & VCO 2 CONTROLS:

- "FREQUENCY" - Controls initial frequency setting of oscillator; covers a five octave range
- "MODULATION" - When turned to the left, selected modulation source modulates the frequency of the oscillator; when turned to the right, selected modulation source modulates the pulse width of the pulse waveform
- "ENV-EXT-LFO" - Selects the modulation source for the "MODULATION" pot from either an envelope generator, an external source or the low frequency oscillator
- "PULSE WIDTH" - Controls initial pulse width of pulse waveform from 10% to 90% duty cycle

VCF CONTROLS:

- "FREQUENCY" - Controls initial frequency setting of filter
- "RESONANCE" - When turned to the right, causes peaking action in the filter
- "MODULATION" - When turned to the left, selected modulation source modulates the frequency of the filter in the negative direction; when turned to the right, selected modulation source modulates the frequency of the filter in the positive direction
- "ENV2-EXT-LFO" - Selects the modulation source for the "MODULATION" pot from either envelope generator #2, an external source, or the low frequency oscillator
- "BP-1P-NOTCH-HP" - When turned all the way to the left and clicked "off", selects BANDPASS filter response; when turned all the way to the left but not clicked "off", selects LOW-PASS filter response; when set at the 12 o'clock position, selects NOTCH filter response; when turned all the way to the right, selects HIGH-PASS filter response

- "VCO 1" - Filter input mixer pot #1; when turned to the left, selects sawtooth waveform from VCO 1; when turned to the right, selects pulse waveform from VCO 1
- "VCO 2" - Filter input mixer pot #2; when turned to the left, selects sawtooth waveform from VCO 2; when turned to the right, selects pulse waveform from VCO 2
- "EXT" - Filter input mixer pot #3; when turned to left, selects external audio input #1; when turned to the right, selects external audio input #2

ENV 1 & ENV 2 CONTROLS:

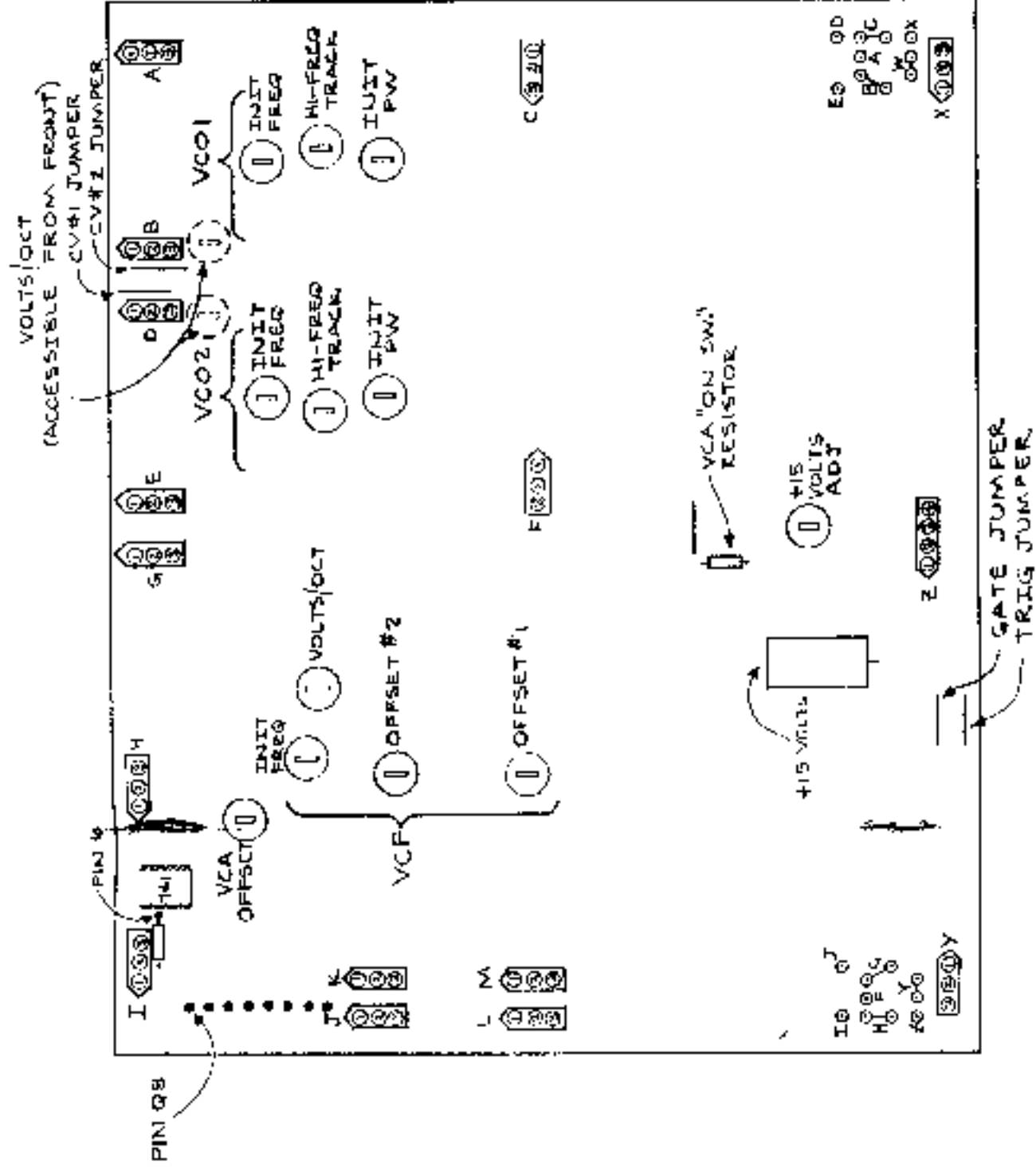
- "ATTACK" - When turned to the right, increases attack time of envelope generator
- "DECAY" - When turned to the right, increases decay time of envelope generator
- "SUSTAIN" - When turned to the right, increases sustain level of envelope generator

LFO CONTROL:

- "LFO" - When turned to the right, increases frequency of oscillation of low frequency oscillator

VCA CONTROL:

- "VCA-ON/EXT" - When switched "on", envelope generator control of VCA is overridden, forcing it into the full amplification state, unless an external "VCA Control Input" is applied, in which case that signal controls VCA



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ELECTRONICS BOARD
IDENTIFICATION
DIAGRAM

*****INPUT-OUTPUT CONNECTIONS*****

All input and output signal connections to the Expander Module occur on several color-coded Molex connectors on the electronics board. The following table summarizes these connections. The connectors can be identified by noting the single alphabetic letter, etched onto the board, adjacent to each connector. Pin 1 of each connector is the pin at the beveled end of the connector.

| CONN. PIN | FUNCTION | CONN. COLOR |
|-----------|-----------------------------------|-------------|
| A1 | External Modulation Input - VCO 1 | Orange |
| A2 | Sawtooth Output - VCO 1 | |
| A3 | Pulse Output - VCO 1 | |
| B1 | Control Voltage Input #1 - VCO 1 | Red |
| B2 | Ground | |
| B3 | Control Voltage Input #2 - VCO 1 | |
| C1 | Sync Output - VCO 1 | Yellow |
| C2 | Ground | |
| C3 | Sync Input - VCO 1 | |
| D1 | Control Voltage Input #1 - VCO 2 | Red |
| D2 | Ground | |
| D3 | Control Voltage Input #2 - VCO 2 | |
| E1 | External Modulation Input - VCO 2 | Orange |
| E2 | Sawtooth Output - VCO 2 | |
| E3 | Pulse Output - VCO 2 | |
| F1 | Sync Output - VCO 2 | Yellow |
| F2 | VCA Control Input | |
| F3 | Sync Input - VCO 2 | |
| G1 | LFO Trigger Input | Brown |
| G2 | Ground | |
| G3 | LFO Output | |
| H1 | Control Voltage Input #1 - VCF | Gray |
| H2 | Control Voltage Input #2 - VCF | |
| H3 | External Modulation Input - VCF | |
| I1 | VCA Output | White |
| I2 | Ground | |
| I3 | Output Amplifier Input | |
| J1 | H1 Pass Output - VCF | White |
| J2 | Ground | |
| J3 | Bandpass Output - VCF | |

| | | |
|----|-------------------------------|-------|
| K1 | Selected VCF Response Output | |
| K2 | Ground | White |
| K3 | Low Pass Output - VCF | |
| L1 | External Audio Input #1 | |
| L2 | Ground | Blue |
| L3 | External Audio Input #1 | |
| M1 | External Audio Input #2 | |
| M2 | Ground | Blue |
| M3 | External Audio Input #2 | |
| X1 | Output - ENV 1 | |
| X2 | Gate Input - ENV 1 | Green |
| X3 | Trigger Input - ENV 1 | |
| Y1 | Output - ENV 2 | |
| Y2 | Gate Input - ENV 2 | Green |
| Y3 | Trigger Input - ENV 2 | |
| Z1 | +18.5 Regulated Voltage Input | |
| Z2 | Ground | Black |
| Z3 | Ground | |
| Z4 | 18.5 Regulated Voltage Input | |

***** STRAPPING OPTIONS *****

The Expander Module electronics board is configured to allow various strapping options which can be changed by the user. Refer to the Identification Diagram for location of strapping option jumpers.

CONTROL VOLTAGE JUMPERS






Normally, Expander Modules are configured at the factory with the control voltage jumpers installed. These jumpers allow both VCO's to be driven from the same control voltage. By removing these jumpers the two VCO's can be driven from separate control voltages.

GATE AND TRIGGER JUMPERS

As with the VCO jumpers, Expander Modules are configured at the factory with the gate and trigger jumpers installed. These jumpers allow both envelope generators to be driven from the same gate and/or trigger signals. By removing them, the envelope generators can be triggered separately.

ENVELOPE GENERATOR INPUT OPTION JUMPERS

The Expander Module envelope generators can be configured by these jumpers to accept different combinations of gate and trigger signals and polarities. When the connections listed in the first two columns are made, the envelope generators will respond properly to the gate and/or trigger signals described in the last column. The letters refer to the jumper wire pads located at the lower corners of the Expander Module electronics board.

| ENV 1 JUMPERS | ENV 2 JUMPERS | INPUT SIGNAL REQUIREMENTS |
|-------------------|-------------------|--|
| X+C W+A B+E | Z+H Y+F G+J | TRIG:  + GATE:  |
| D+C W+A B+E | I+H Y+F G+J | GATE:  |
| D+C W+B B+E | I+H Y+G G+J | GATE:  |
| X+C | Z+H | TRIG:  |

In order to allow maximum flexibility of use with ARP-interface configured Expander Modules, the Gate + Trigger jumper option is recommended. In addition, +15 volts is wired to the "Gate-In" connector's "sleeve" connection. This allows the Expander Module to be used with an ARP's Gate and Trigger signals when it is driven directly by an ARP synthesizer, or if the "Gate-In" connector has no cord plugged into it, just a Trigger signal will cause the envelope generators to operate (such as provided by a Digital Sequencer).

***** EXPANDER MODULE ADJUSTMENTS *****

A) POWER SUPPLY ADJUSTMENTS:

Adjust "+15 Volts" trimmer so that the voltage measured across the +15 volt capacitor is 15.00 volts.

B) VCO 1 ADJUSTMENTS:

- 1) Using oscilloscope, observe OSC 1 output at pin A3 and adjust "Init PW" trimmer for 50% duty cycle pulse wave with PULSE WIDTH pot set in the center of its range.
- 2) Set FREQUENCY pot full CCW and adjust "Init Freq" trimmer for 35 HZ output with no CV-IN.
- 3) With a CV-IN of approximately +3 volts (three octaves up from bottom of keyboard), zero beat output of OSC 1 with an external oscillator with accurate volts/octave relationship and driven by the same CV-IN, by adjusting FREQUENCY pot. Then change CV-IN to 0 volts (bottom note on keyboard) and adjust "Volts/Octave" trimmer (accessible thru hole in control panel) for zero beat. Repeat as necessary to make the two oscillators track.
- 4) Move FREQUENCY pots on both OSC 1 and external oscillator up several octaves and zero beat with 0 volts CV-IN (using FREQUENCY pot). Apply +3 volts CV-IN and zero beat by adjusting "H1-Freq Track" trimmer.
- 5) Repeat 3) and 4) once.

C) VCO 2 ADJUSTMENTS:

- 1) Repeat procedure B), steps 1) thru 5), except use OSC 2 rather than external oscillator.
- 2) After above adjustments are completed, set both OSC 1 and OSC 2 FREQUENCY pots fully CCW and adjust OSC 2 "Init Freq" trimmer to zero beat oscillators.

D) VCF ADJUSTMENTS:

- 1) Using oscilloscope, observe pin 28 on board-to-board connector. (This pin is the one nearest connector pin 11)
- 2) Turn NOTCH pot to "HP".
- 3) Adjust "Offset 1" trimmer for zero volts.
- 4) Turn NOTCH pot to "LF".
- 5) Adjust "Offset 2" trimmer for zero volts.
- 6) Center VCO 1 FREQUENCY pot and VCF FREQUENCY pot.
- 7) Apply VCO 1 pulse waveform to VCF and rotate RESONANCE pot fully CW.
- 8) Adjust VCF "Init Freq" trimmer until fundamental (first harmonic) is prominent.
- 9) Jumper CV-IN to pin 41.
- 10) Depress key one octave above lowest key and adjust VCF "Volts/Octave" trimmer for maximum signal.
- 11) Repeat steps 1) thru 5).

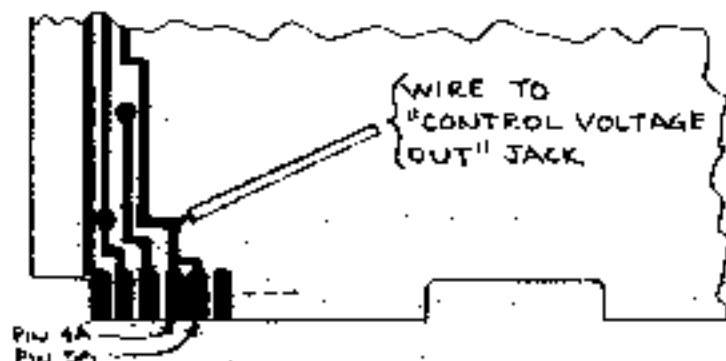
E) VCA ADJUSTMENTS:

- 1) Using oscilloscope, observe pin 5 of 741 op. amp. nearest connector 1.
- 2) While repeatedly pressing and releasing keyboard key (to generate Gate and/or Trigger pulses) adjust VCA "Offset" trimmer for no voltage change.

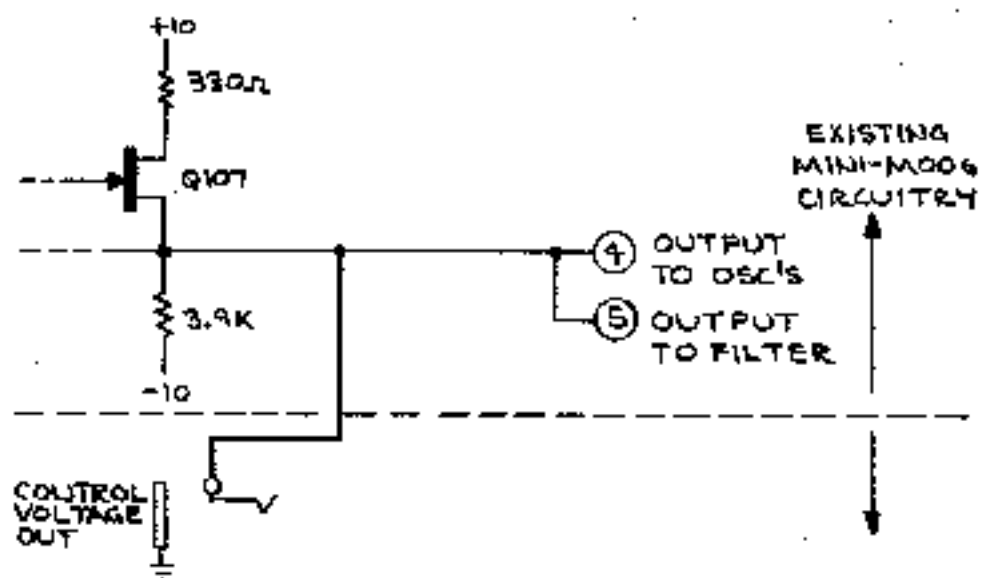
***** MINI-MOOG MODIFICATIONS *****

- 1) Expose electronic circuitry by removing metal cover held on by 18 sheet metal screws.
- 2) Looking at rear of Mini-Moog, remove right-hand printed circuit board (Board #1). Set aside temporarily.
- 3) Remove other right-hand printed circuit board (Board #2) which resides behind Board #1.
- 4) Install a phone jack (such as Switchcraft #11) just left of the jack labeled "LOUDNESS EXTERNAL CONTROL INPUT". Label this jack "CONTROL VOLTAGE OUT".
- 5) On Board #2, solder a 14-inch wire to the etching point shown in the Figure.
- 6) Solder the other end of this wire to the Jack you just installed.
- 7) Connect the ground terminal of the new jack to the ground terminal of an adjacent jack.
- 8) Replace both printed circuit boards and the metal cover.

MINI-MOOG BOARD #2



FIGURE



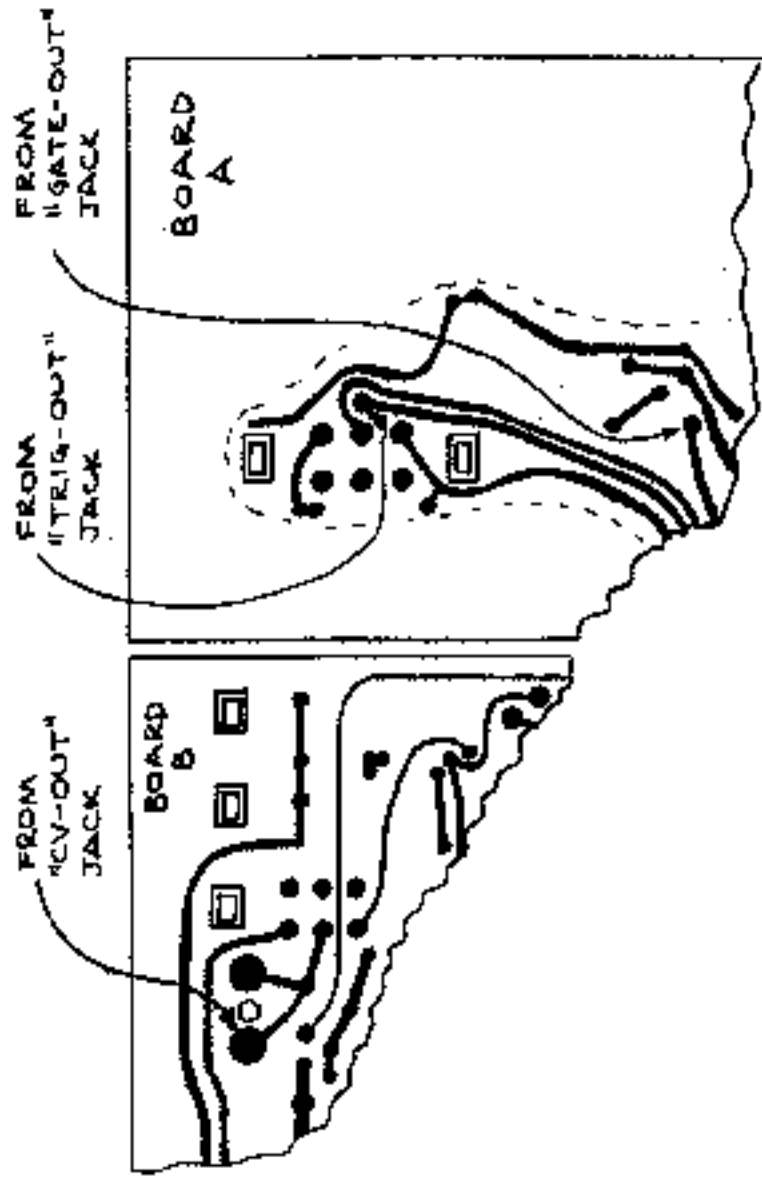
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SCHEMATIC

MINI-MOOG
MODIFICATION
FOR USE WITH
OBERHEIM
EXPANDER MODULE

***** ODYSSEY MODIFICATIONS *****

- 1) Remove Odyssey plastic bottom to expose circuitry.
- 2) Drill three 1/4" holes and install three mini-jacks (such as Switchcraft # 142A) between the jack labeled "High Level" and the side of the Odyssey. Position these holes toward the bottom flange so that the jacks do not interfere with the Odyssey circuitry.
- 3) Label the mini-jacks:
 "CY-OUT"
 "GATE-OUT"
 "TRIG-OUT"
- 4) Wire the jacks to the appropriate circuit points by referring to the diagram.
- 5) Replace the plastic bottom.



FIGURE

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ODYSSEY
MODIFICATIONS
FOR USE WITH
OBERHEIM
EXPANDER MODULE

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