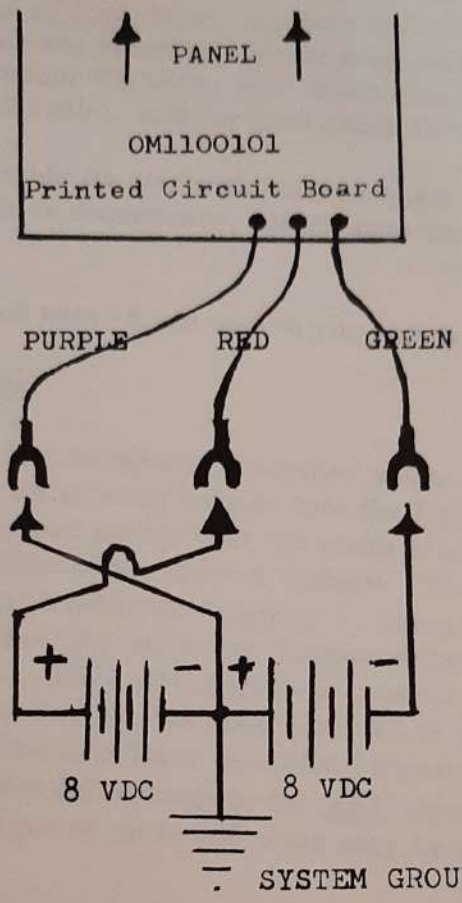
Caution

Be certain to observe polarity. The circuitry of the OM1100101 contains protective diodes to guard against damage in event of misconnection. However, extreme care should be taken to make the correct connections.

A diagram of a typical hookup using two power sources is as follows:



Care should be taken to balance the split supply voltages as accurately as possible to provide optimum operating characteristics.

Front Panel Connections

There are two types of inputs on the front panel, a reference voltage input marked REF and using a yellow banana jack, and a signal input marked IN. Two jacks are provided for the signal input, a blue banana jack and a standard phone jack, wired in parallel for either banana or phone plug operation. Two output jacks using a green banana jack and a standard phone jack in parallel, marked OUT, are provided for the same either/or operation. A black banana jack marked GND is provided for convenience in connecting to a system ground.

The front panel size is 3.5" high by 2.9" wide. A 2.75" deep minimum mounting space is required; however, a 3" space is recommended to provide access to the power supply wires.

NEURONA COMPANY

Model OM1100101 Analog Systems Voltage Controlled Harmonic Generator-Wave Shaper

OPERATING INSTRUCTIONS

GENERAL

The Model OM1100101 module is a multi-function device designed for use in the synthesis of electronic music either as the basic unit of an integrated system or in complement with existing equipment currently on the market. Provisions have been made to adjust its response to be compatible with a wide range of voltage controlled systems including synthesizers and analog computors. Direct digital interface can be accomplished in some situations and the use of matrix switching devices allows the development of electronic music synthesizing software systems.

The OM1100101 has four basic operating modes providing a wealth of synthesizing functions, all of which are switch selectable. They are : A- Voltage Controlled Harmonic Generator; B- Wave Shaper-Analog Gate; C- Voltage Controlled Oscillator; D- Modified Schmitt Trigger. Their individual operating characteristics will be explained in detail under OPERATION. The voltage control function of the units are controlled by the ratio of two voltages, one applied to the signal input and the other to the reference input. Thus, variation of either voltage input will cause a change in the output of the module. If one input is maintained at a static level, its value will determine the range of response of the other input. This makes it possible for the OM1100101 to respond optimally to control inputs that lie within a range of approximately 3 to 100 volts. The circuitry used is exemplorary of "state of the art" computor type circuitry making possible the wide latitude of applications. The use of more than one module is particularly arresting due to the extent of inter-unit programing possible. Results such as complex sequences of "notes" with analog control voltages, previously only possible with digital type devices such as sequences, can be achieved.

INITIAL HOOKUP

Power Supply Connections

Two power supply voltages are needed for operation of the OM1100101. Three colored wires extruding from the back of the unit are provided for this. Connect +8 vdc to the red wire, -8 vdc to the green wire, and connect the purple wire to ground. The module will operate with only minimum changes in characteristics on split supply voltages of approximately +5.5 vdc and -5.5 vdc to approximately +9.5 vdc and -9.5 vdc. Thus, it can be powered from two 9 volt transistor radio batteries. Power consumption is typically 19 ma for +8 vdc and -8 vdc operation. Spade lugs are provided on the power supply wires for connection to binding posts.

SUMMATION

Operating Scope

These samples are meant to be examples with which to become acquainted with the OM1100101 only and in no way are conclusive as to the scope of possibilities of the module. The use of more than one unit provides interprogramming possibilities that are so great that no attempt will be made here to describe them. The production of complex sequences from analog control voltages by feeding a single source wave and a single control voltage to a set of modules is a slight hint. NEURONA COMPANY encourages as much experimentation as is possible with all of its products in the hope that new and better uses will be found for them.

Both the signal input and output of the modules are duplicated on the front panel in banana and standard phone jacks for convenience of interface with existing equipment. Units with miniphone jacks in place of standard phone jacks are available on request.

GUARANTEE AND SERVICE

NEURONA COMPANY guarantees all of its products against defects in materials and workmanship for a period of one year.

In the event of malfunction or failure, it is recommended that the OM1100101 be repaired only at the factory because of the precise and critical parameter requirements of the integrated circuit technology utilized. Arbitrary isnertion of standard components can cause catastrophic failure of the unit and should not be attempted. It is for this reason that schematics are not provided. Repaired products are tested to original operating specifications and returned as soon as possible.

All NEURONA COMPANY products are subjected to rigorous testing including at least 72 hours of continuous operation, application of overrated signals and voltages, and retesting.

TERMS OF SALE

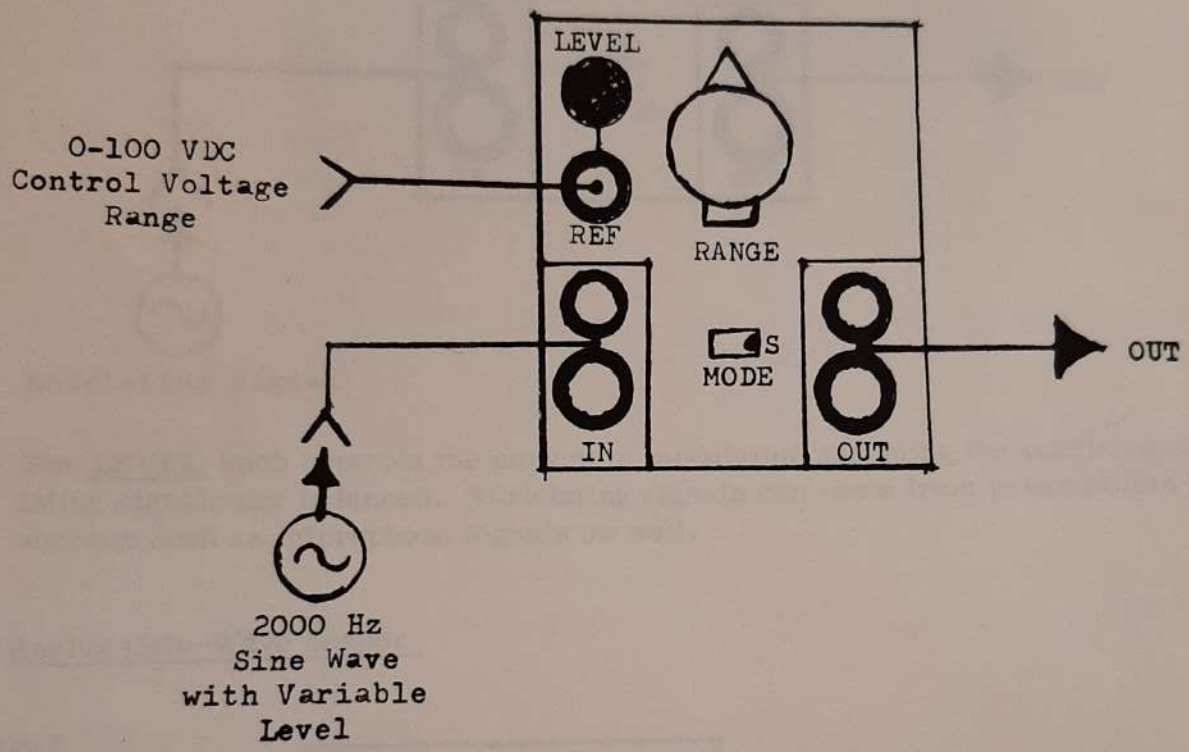
The terms of sale on all equipment orders of less than $400.00 are cash in advance. On orders larger than this, terms are 50% on order and the balance on delivery. Unless otherwise specified delivery of small units will be made by parcel post or United Parcel Service. Additional costs for items shipped by any other means or items shipped outside the continental United States and Canada will be assumed by the purchaser.

NEURONA COMPANY was founded in 1969 with the long range goals of increasing humanization through the scientist-artist bond and the building of an institution capable of supporting projects in the technological media arts and distributing them through available commercial channels.

Enquire about NEURONA COMPANY's design and development service for artists.

NEURONA COMPANY
1024 Avenue of the Americas, New York, N. Y. 10018

Voltage Controlled Harmonic Generator



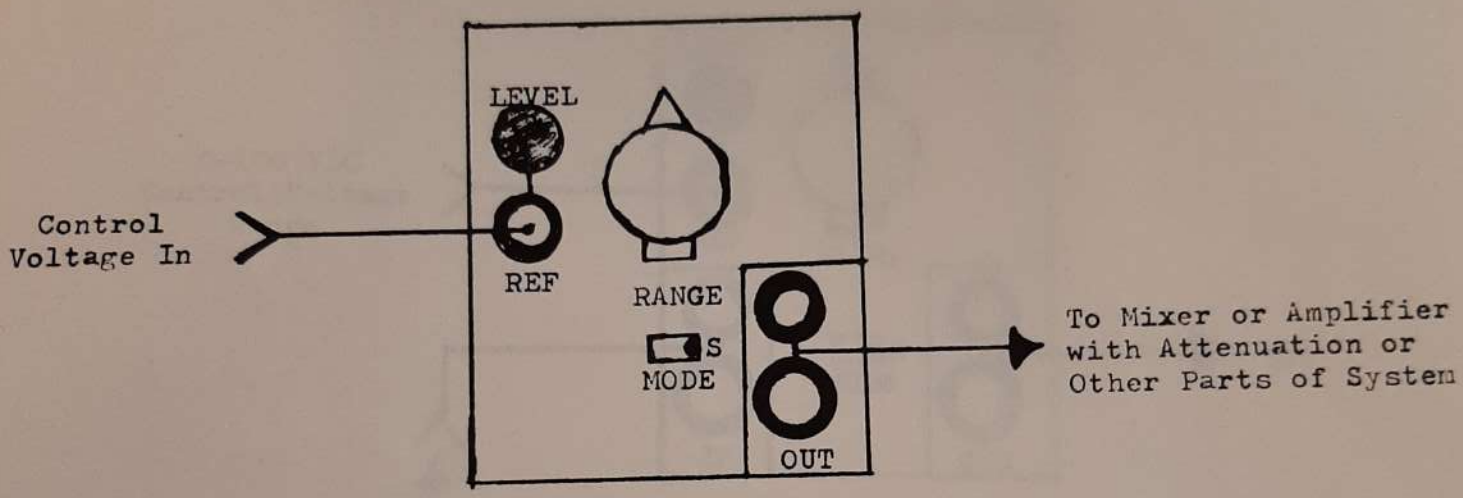
Application of a constant high level dc voltage to the REF input gives manual control of harmonics by varying the LEVEL and RANGE controls. A varying control voltage provides automatic control. Widest range is achieved with a signal voltage of approximately 1.5 to 2.5 volts, and a control range of 0 vdc to 25 vdc or greater.

with careful adjustment of all knobs to produce the desired effect.

The knob marked GATE controls the overall output level of the unit in this position. It is nonfunctional in either the T or S mode.

FUNCTIONAL EXAMPLES

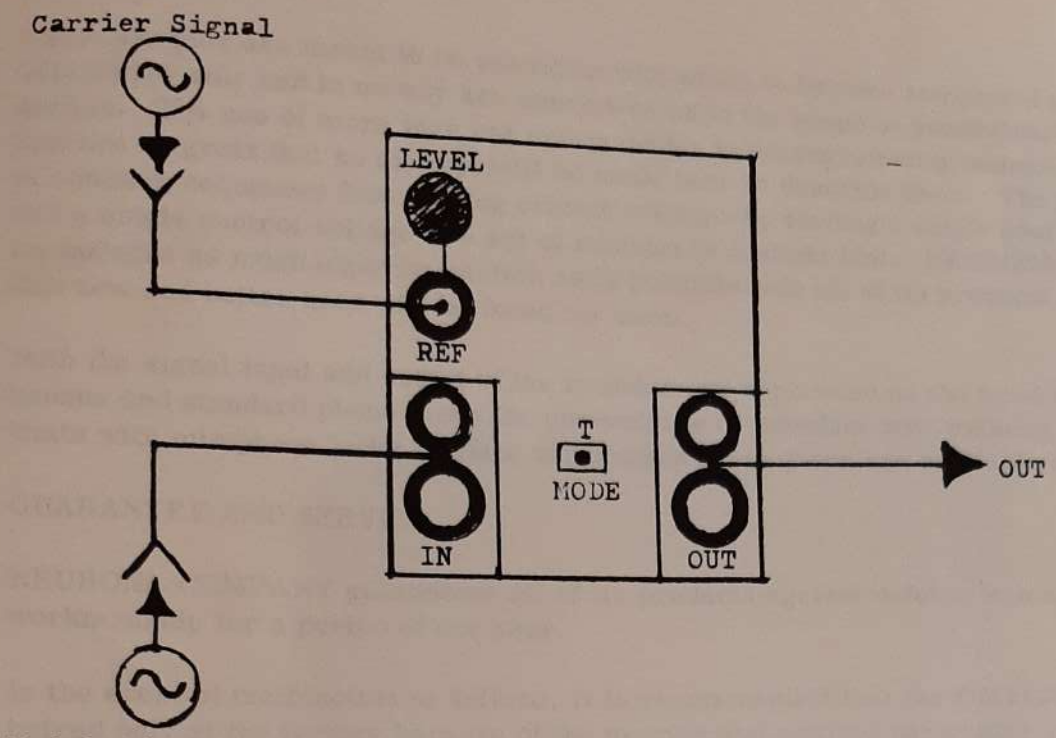
Voltage Controlled Oscillator with Frequency Modulation



In frequency modulation uses, the LEVEL knob controls the amount of modulation. The amount of continuous sweep possible from the oscillator is determined by the amount of variation in level of the control voltage.

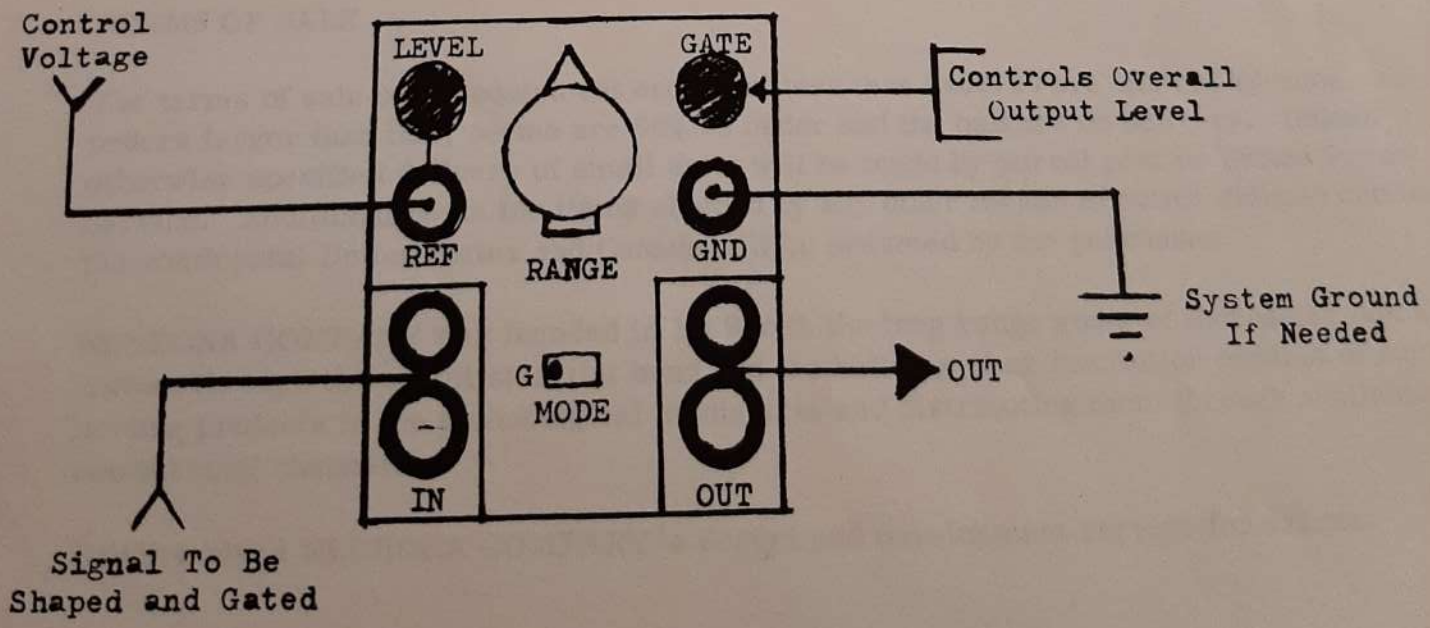
NOTE: Unless otherwise stated, all references to DC control voltage are understood to be positive.

Schmitt Trigger Modulator



The LEVEL knob controls the amount of modulation assuming the carrier and modulating signals are balanced. Modulating signals can come from preamplified live sources such as microphone signals as well.

Analog Gate-Wave Shaper



The incoming signal is being shaped by the addition or subtraction of harmonics as it is being gated according to the control voltage level variation.

Trigger function is obtained such that

$$e_{out} = +V_z IF\ e_{in} < e_{ref}$$

or

$$e_{out} = -V_z IF\ e_{in} > e_{ref}$$

where e_{out} = the voltage output of the module, e_{in} = the signal IN voltage, e_{ref} = the REF voltage, and V_z for this particular circuit is 4.5 volts constant. Some applications of this mode are as a squaring circuit, switching circuit, modulator (similar in acoustical effect to that of a ring modulator). All of these functions are obtained with the LEVEL control fully clockwise. Turning this control counterclockwise modifies the turn-on and turn-off slope of the switching circuit such that it becomes an analog gate. In this fashion the OM1100101 can be used to control the envelope shape of a signal applied to the IN signal input. The sharpness of the turn-on slope (the sharpness of the attack), as the control voltage moves from 0 to approximately 25 vdc is determined by the setting of the LEVEL control. For complete attenuation (turn-off) of the signal as the control voltage decreases, the level of signal applied to the IN signal input should be no greater than 2 volts ac.

To achieve Schmitt Trigger modulation which is acoustically similar to ring modulation turn the LEVEL control fully clockwise and apply the two signals to be modulated to the IN and REF inputs. The amount of modulation will be controlled by the level of the two inputs plus the position of the LEVEL control. When adjusted properly the output of the module will turn off when the signal on the IN input drops out. However, when the signal applied to the REF input drops out, the IN signal will still be allowed to pass through.

The RANGE control is nonfunctional in the T mode.

Combined Gate and Wave Shaper

Mode switch in position G. In this position the OM1100101 functions as a gate in the manner described under Modified Schmitt Trigger, combined with the ability to add and subtract harmonics cumulatively to a signal applied to the IN input. In this way the timbre of a sound may be altered and wave shapes may be "drawn" into other shapes either alone or while they are being gated. The controls affecting this function include the levels of both the signal and the control voltage, the LEVEL control, and the RANGE switch. The higher the position the RANGE switch is in the more high partials will be added during operation. The lower it is the more high partials will be subtracted. For example, feeding a sine wave into the signal input, the output can be gradually varied by raising the RANGE control until a square wave is produced. Similarly, a square wave can be gradually changed into a triangle wave by lowering the RANGE switch to subtract the higher partials. The variation will also be affected by all the other settings mentioned above. Thus, a sound can be both automatically shaped and gated by a control voltage

OPERATION

Oscillator

Place mode switch to position S. Connect output to amplification system. Module will give a highly stable variable output/positive going pulse type waveform. Frequency is controlled by the LEVEL knob. Turning the knob clockwise will lower the frequency. Various ranges are selectable by the nine position RANGE switch. Each range is approximately a minor 7th wide, (one whole tone less than an octave on a standard tempered musical scale), and the total range is from 8 Hz to 6000 Hz.

The pulse waveform is suitable for use with various types of equipment that require pulses to trigger them such as sequencers, attack generators, gates, sequential switches, etc.

The output voltage when used with +8 vdc and -8 vdc supply is 4.5 vac.

Voltage Controlled Oscillator

Mode switch in position S. The oscillator described above can be made voltage controlled simply by plugging a controlling voltage into the REF input. The RANGE control functions in the same manner except that the width of each range setting is determined by the degree of variation of the control voltage. The width can be made extremely wide and the positions considerably overlapping by using a control voltage of sufficient level. All inputs applied to the REF input are attenuated by the LEVEL control before they enter the basic circuitry. Thus, the degree of control that external control voltage has on the oscillator can be varied by this knob from 0% to 100%. The width of each range of the manually controlled oscillator described above can also be greatly extended by applying a constant high level DC voltage to the REF input and varying it by means of the LEVEL control. DC voltages of up to 100 volts may be safely applied to the REF input.

Voltage Controlled Harmonic Generator

Switch in mode S. A pure signal source such as that from a sine wave generator is connected to the signal input. This input will accept any line level signal and has a high input impedence. Connect a DC voltage to the REF input. The module will produce an inverted harmonic series by dividing the signal input frequency by an integer divisor which is determined by the level of the control voltage. As the control voltage moves up and down the output of the module will shift up and down the harmonic series. The specific note in the series that appears at the output results from the ratio of the two voltage levels that appear at the signal, IN, input and REF input. Thus, a variation in either one of the levels will shift the output up and down the series. Since the harmonic series is produced by division, the widest range will be obtained by feeding in a high frequency signal, a 2000 Hz sine tone, for example, to the signal input. All frequencies that appear at the output will be whole number divisions of 2000 Hz in this case.

Modified Schmitt Trigger

Mode switch in position T. With the LEVEL control turned fully clockwise, the Schmitt