902 VOLTAGE CONTROLLED AMPLIFIER

The 902 Voltage Controlled Amplifier is a signal processing module for amplitude modulation of signals within the frequency range from DC to over 50,000 cycles per second. It permits variable gain up to a factor of 2 (+6 dB), by manual or voltage control, with either linear or exponential gain response to the control signal. It has complementary inputs and outputs, and produces two quadrant multiplication of signals connected to the signal processing and control inputs. Typical applications include amplitude contouring, modulation, and gating of both audio and control signals.

- **80 dB Dynamic Range**
- **DC to 50,000 Hz Frequency Range, Signal and Control Inputs**
- **Amplification Factor of 2X**
- **Complementary Inputs and Outputs**
- **Linear and Exponential Control Response**

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CONTROL PANEL FEATURES:

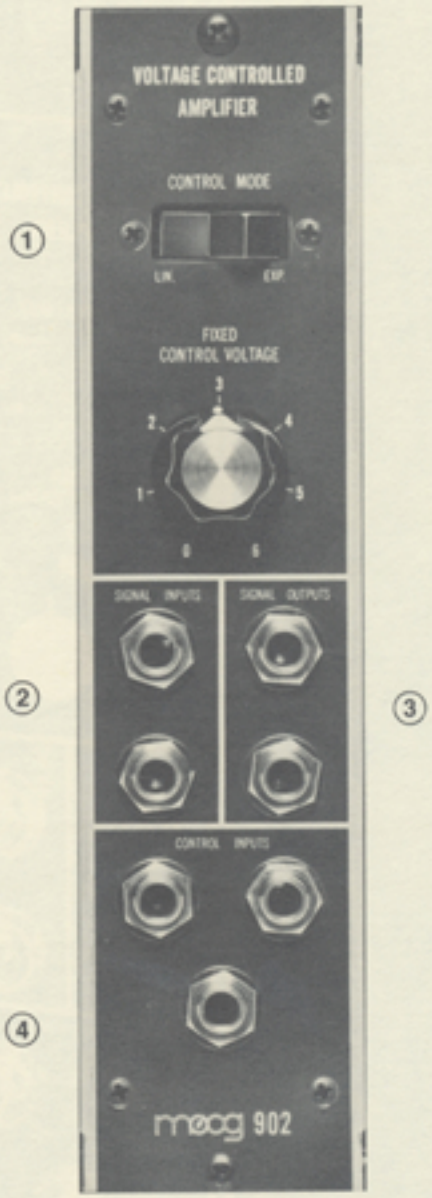
In **Section (1)** the FIXED CONTROL VOLTAGE knob determines the basic gain, which is then varied by the sum of all control signals applied to the CONTROL INPUTS in **Section (4).** The type of gain response to a control signal is selected by the CONTROL MODE switch; either a LINEAR or EXPONENTIAL response is available. Signals to be processed may be connected to either SIGNAL INPUT jack **Section (2).** The modulated signal appears at both SIGNAL OUTPUT jacks **Section (3).** Each set of jacks forms a complementary pair. The upper SIGNAL INPUT is inverting, the lower SIGNAL INPUT is non-inverting; the upper SIGNAL OUTPUT is non-inverted, and the lower SIGNAL OUTPUT is inverted.

MUSICAL APPLICATIONS:

The 902 Voltage Controlled Amplifier has a variety of audio signal processing applications. The loudness of the audio signal passing through the module can be set by the FIXED CONTROL VOLTAGE knob. With that control at "O", the 902 Voltage Controlled Amplifier can impart a dynamic contour proportional to the voltage contour of the control signal. For example, a control signal from a 911 Envelope Generator can produce a wide variety of articulation patterns. A periodic waveform control signal, such as a descending sawtooth, can produce a sharp attack and smooth decay, followed by silence of equal duration. Increasing the FIXED CONTROL VOLTAGE in this application will lengthen the amplitude contour's duration and raise the amplitude proportionally; the control signal sum is being raised to lie principally or entirely in the positive voltage range. In each of these applications, the setting of the CONTROL MODE switch will have a distinct effect on the relation between the processed signal's articulation pattern and the control voltage contour.

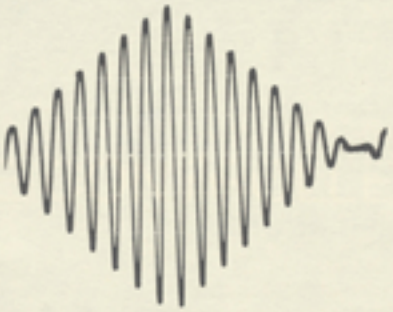
Since voltage control is basic to modern synthesizer modulation systems, the 902 Voltage Controlled Amplifier is essential to many dynamic modulation effects. For example, when processing a control signal which is being used to create a vibrato in an audio signal, the 902 Voltage Controlled Amplifier permits contouring of the control signal, producing a continuously variable "width" in the vibrato effect. In a similar fashion, the dynamic range of an amplitude modulation effect, or the resonance range of a "wah-wah" type spectrum modulation effect can be continuously varied.

If the signal being processed and the control signal are both periodic waveforms with frequencies in the audio range, timbral effects similar to "ring modulation" will be produced. This effect can be more closely approximated by mixing the processed signal with the inverted unprocessed signal, and balancing their amplitudes until the unprocessed signal is suppressed. Many "clangorous" sounds similar to gongs or chimes can be produced in this manner. The versatility of control response and the low distortion of the 902 Voltage Controlled Amplifier establishes its value to any sound processing system.



CONTROL SIGNAL RESPONSE

50 Hz TRIANGULAR WAVE 6 VOLTS PEAK-TO-PEAK, APPLIED TO CONTROL INPUT.

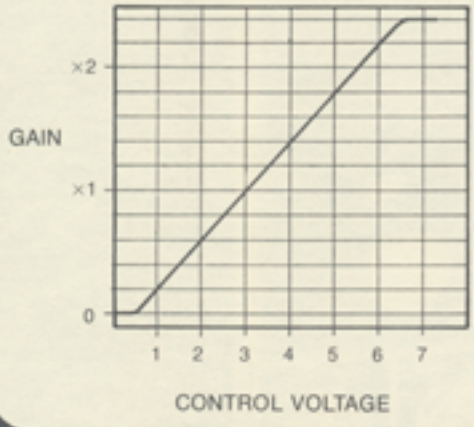


OUTPUT: LINEAR CONTROL MODE. INPUT IS 1 kHz. SINE WAVE. FIXED CONTROL VOLTAGE = 3.

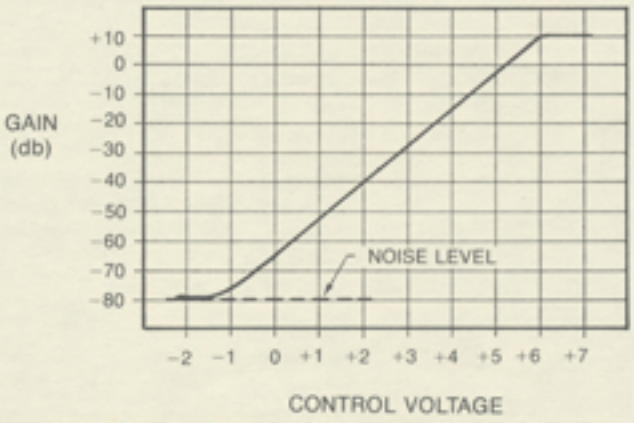
OUTPUT: EXPONENTIAL CONTROL MODE. INPUT IS 1 kHz. SINE WAVE. FIXED CONTROL VOLTAGE = 3.

GAIN VERSUS CONTROL VOLTAGE

FIXED CONTROL VOLTAGE = 0
CONTROL MODE = "LIN."
SIGNAL INPUT = 0.5 V. RMS

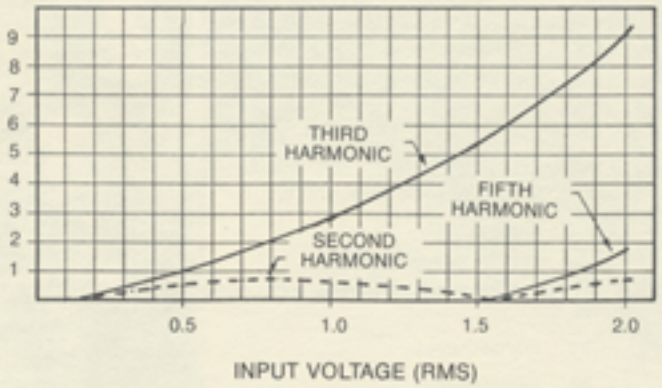


FIXED CONTROL VOLTAGE = 0
CONTROL MODE = "EXP."
SIGNAL INPUT = 0.5 V. RMS



DISTORTION PRODUCTS VS. INPUT VOLTAGE

PERCENT DISTORTION PRODUCTS AT OUTPUT



FIXED CONTROL VOLTAGE SET TO GIVE UNITY GAIN AT LOW SIGNAL LEVEL

f_{in} = 1 kHz

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MECHANICAL SPECIFICATIONS:

Panel Size:	8¾" high x 2⅛" wide
Depth Behind Panel:	6¼", excluding rear connector
Rear Connector:	Printed circuit card fingers 3.590" wide. Mates with 22-pin connector. (.156 centers)

ELECTRICAL SPECIFICATIONS:

Frequency Response of Signal Inputs:	50 kHz minimum
Frequency Response of Control Inputs:	50 kHz minimum
Output Noise (gain = 0):	−85 dBm
Equivalent Input Noise (20-22 kHz):	−82 dBm
Input Level Which Gives 2% Total Harmonic Distortion:	0 dBm (mostly third harmonic)
Gain/Control Characteristic, LINEAR Mode:	Gain increases from 0 to ×2 (6dB) linearly as control voltage sum increases from 0 to +6 volts. (see graph)
Gain/Control Characteristic, EXPONENTIAL Mode:	Gain is 0 dB when control voltage sum is 5.25 ± .25 volts, and decreases 12 ± 1 dB per volt decrease in control voltage sum.
Signal Input Impedance:	10K nominal
Control Input Impedance:	100K nominal
Output Impedance:	600 ohm nominal
Power Supply Requirement:	+12.00V ± 0.1% @ 50 ma − 6.00V ± 0.1% @ 30 ma
Short Circuit Protection:	All outputs and inputs may be shorted to +12V, ground, or −6V indefinitely.

Pin Number	Function
1	+12 volts Supply Input
2	Ground
3	−6 volts Supply Input
8	Signal Input
9	Signal Input
12	Gain Control Node (Z_{in}<0.1 ohm)
13	Ground
16 17 18	Control Inputs (in parallel with Control Input Panel Jacks)
21	Signal Output
22	Signal Output

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