OPUS 3 by MOOG
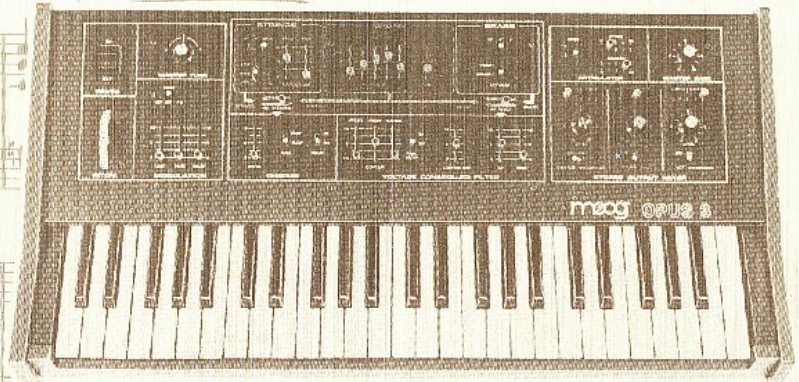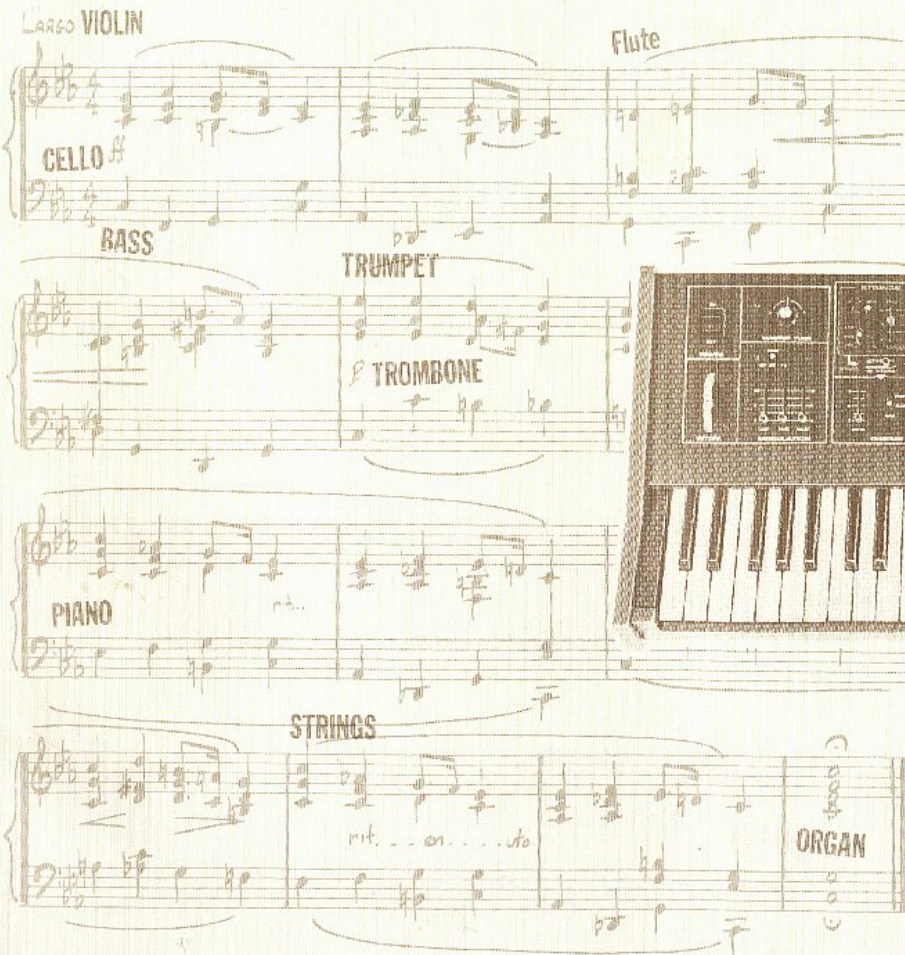
moog ®

OPUS 3

OWNER'S
MANUAL

by Herb
Deutsch

INTRODUCTION

Welcome to OPUS 3 and to the world of Moog! OPUS 3 is an exciting new addition to the family of Moog instruments that have led the field of electronic music since 1964.

Your OPUS 3 has been musically engineered to produce the sounds of today. It is a polyphonic synthesizer capable of easily producing strings, organ, brass and a vast number of combined and layered voices.

This manual has been prepared to take you through the instrument in a step-by-step manner. Every sound chart in the book will take you closer to realizing the full potential of your instrument.

It is advisable, therefore, that you simply begin at the beginning and follow the text to the end. Set up every sound. Play and experiment with each.

By the time you have completed the manual, you will be discovering the pleasures of your own explorations with OPUS 3.

Enjoy!

Herbert A. Deutsch
Director of Marketing

MOOG MUSIC INC.

1

INITIAL SET UP

To set up, plug the power cord into the rear of OPUS 3 and into any grounded A.C. outlet. Using a 1/4" patchcord, connect the MONO output to your monitoring system or amplifier. Detailed instruction on the use of the STEREO OUTPUTS is included further on in this manual.

Save your shipping carton for repacking your OPUS 3 for long distance transport, if required.

SOUND CHARTS

Sound charts are pictures of your OPUS 3 control panel. They are used throughout the manual. When duplicating the settings indicated on these charts, be careful to place sliders and rotary knobs *exactly* as they are pictured.

STARTING POSITION
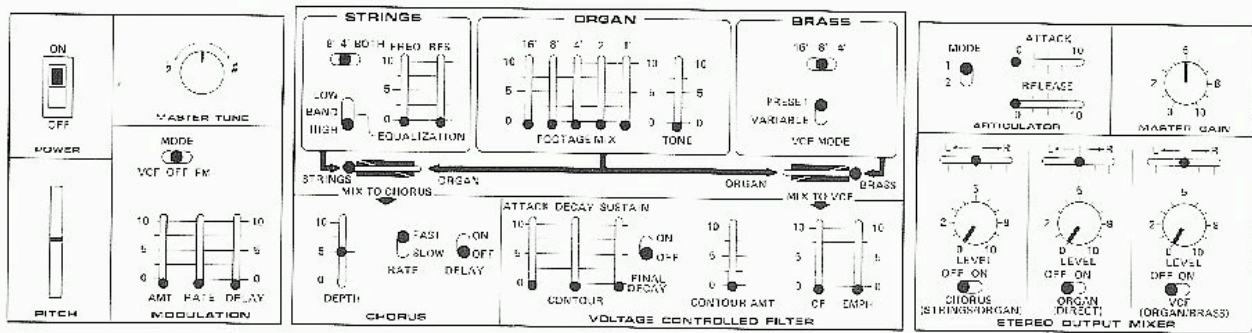
This chart provides a starting point for using the OPUS 3 owner's manual. Set all controls in this position. Note the location of the STRING, ORGAN and BRASS voice sections and the color-coding in the STEREO OUTPUT MIXER. No sound will be heard in this setting!
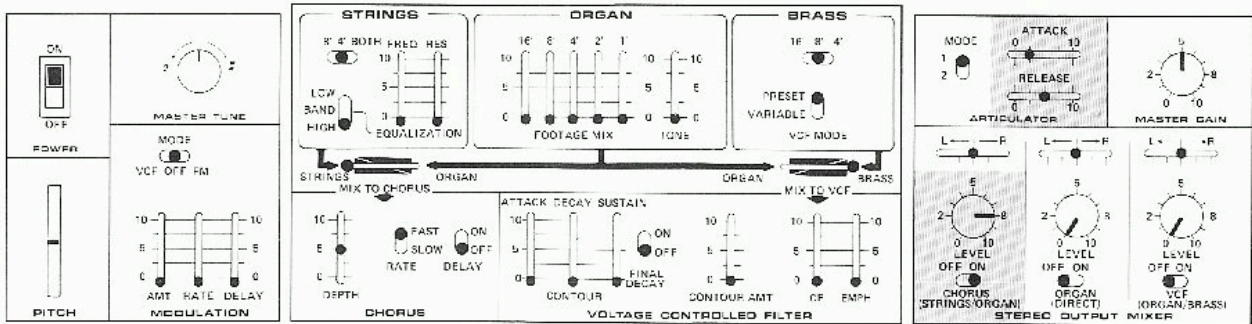
2

THE BASIC VOICES OF OPUS 3

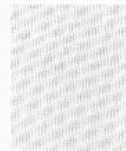OPUS 3 begins with three basic voice sources:

STRINGS

ORGAN

BRASS

Each voice appears at a separate output in the STEREO OUTPUT MIXER at the lower right portion of the panel.

Each of the following sound charts represents a typical setting for producing the basic voices.

STRINGS (Violin)

This shading appears on some of the following sound charts to indicate where a change from starting position has been made.

ORGAN (Pipe Organ)

BRASS (Trumpets)

4

The STEREO OUTPUT MIXER provides the opportunity to combine the basic voices in a number of ways. In the following sound charts four such possibilities are shown.

BRASS AND STRINGS (Trombones and Sustaining Violins)
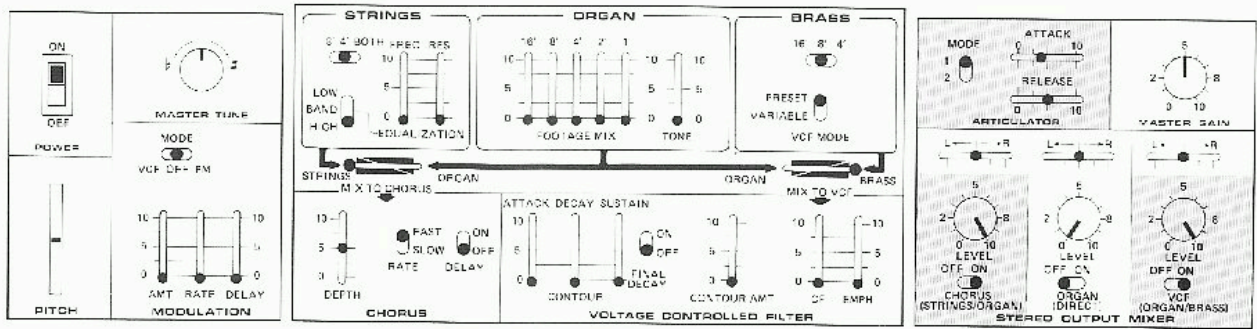
BRASS AND ORGAN (Trumpets and Pipe Organ)

5
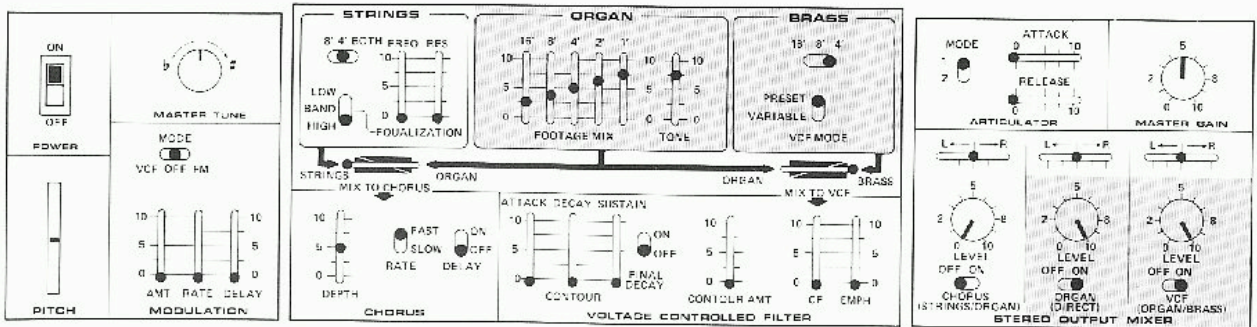
STRINGS AND ORGAN (Electric Organ, Violins with Crescendo)

STRINGS, ORGAN AND BRASS

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VARYING THE BASIC VOICES

Every performer will wish to satisfy personal esthetic tastes, and Moog has designed a widely variable musical instrument in OPUS 3. The basic voices can be altered, modified and literally sculpted to fit the requirements of each performance or the tastes of each player.

FOOTAGES

The STRING and ORGAN sections each have extensive variability. With each voice it is possible to change or combine octaves (footages) and to modify the tone color through filtering.

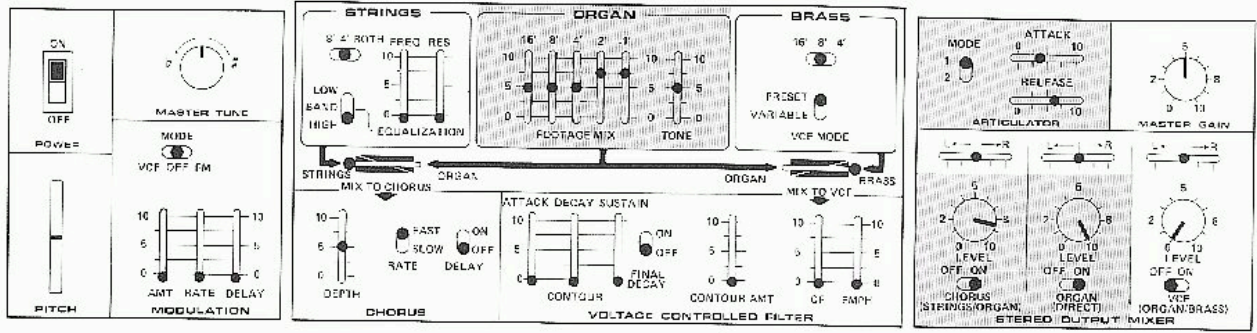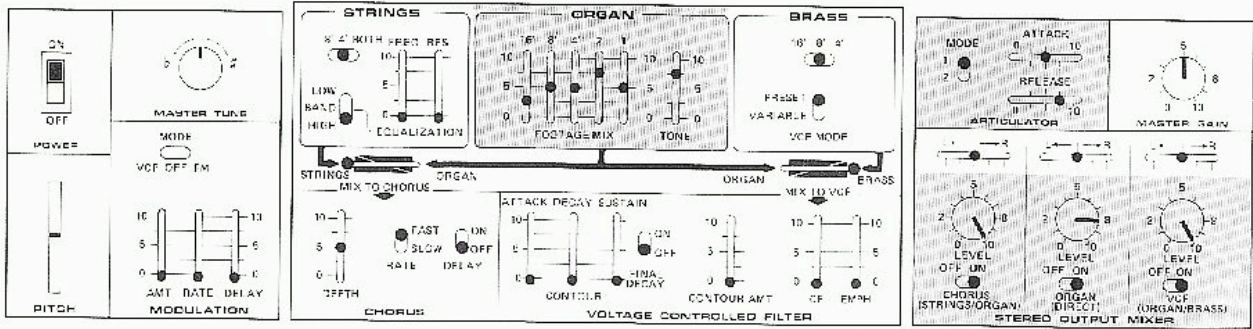The term "footages" goes back hundreds of years in music, originally referring to the actual length of organ pipes. To understand footage as it is used today, it is necessary only to realize that 8' (eight foot) should be taken to mean that the note played on the keyboard should sound the identical pitch as the same note played on a piano. From that reference point 4' refers to the same note sounding one octave higher, 16' sounding one octave lower, and so forth.

In the STRING voice, footage changes can be used to create violins (4') or violas and cellos (8'). The selector switch also enables you to combine both ranges for full string section effects.

At this point, go back to the STRINGS (Violin) sound chart on page 3. Experiment with footage changes available on the STRING voice. Note the effects of playing at different registers (high and low) on the keyboard when using the different footages.

In the ORGAN voice, five footages are available ranging from 16' to 1'. This will enable you to create both rich pipe organ effects and contemporary electronic organ sounds.

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The following sound chart is intended to serve as a starting point for the exploration of ORGAN footages. First, set up the sound as indicated, then experiment with various footage settings.

CHIME ORGAN
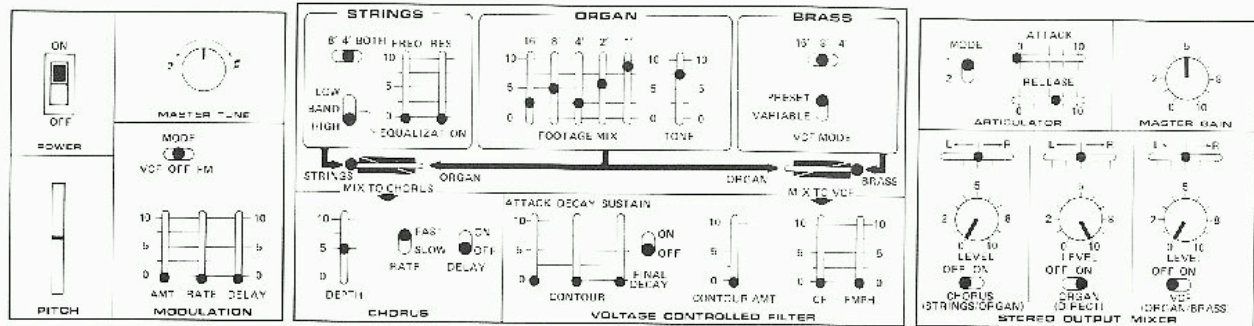
FILTERING

Both the STRING and ORGAN sections of OPUS 3 are equipped with filters for modifying the tone color of the voice.

The filtering of the STRING section provides complex alteration of the basic tones in order to produce the many different string sounds desirable in today's music. This STRING filter may be switched to act as a low pass, band-pass, or high pass equalizer. In all three modes, the cutoff frequency and resonance may be altered by the sliders.

8

The following sound chart is intended to present a starting point in exploring the STRING filter.

MUTED VIOLINS
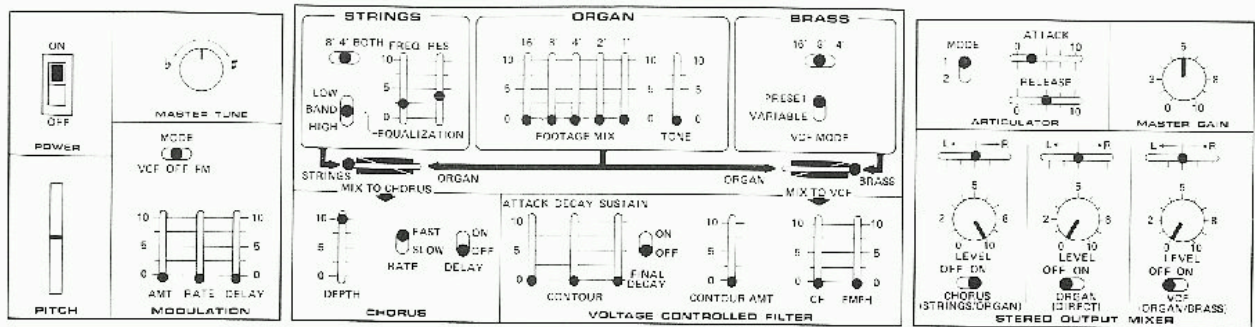
Notice the brightening effect when the FREQ slider is increased from 2.5 to 7.5. Gradually moving that slider back and forth gives an effect quite similar to that of a "phase shifter."

Change the filter mode to LOW. Note the effect created by moving the FREQ slider over its entire range. (It will close the filter altogether when set at 0.)

Change the filter mode to HIGH. Note the effect created by moving the FREQ slider over its entire range. (It will close the filter altogether when set at 10.)

Leaving the FREQ slider at 5, increase and decrease the RES (resonance). Note the effect.

9

The ORGAN filter is a simple tone control similar to that of a high fidelity amplifier system.

Set up any preceding ORGAN sound chart and notice the effect produced by varying the ORGAN TONE slider.

CHORUS

The CHORUS section of OPUS 3 produces a rich multiple-voice effect with varying depth. In addition, a sense of "ensemble" is created by a continually shifting movement of the voices. Both of these effects can be delayed so that they can increase in intensity gradually after the initial tones have begun.

The CHORUS DEPTH slider determines the amount of CHORUS effect that will be heard.

FULL STRING CHORUS

10
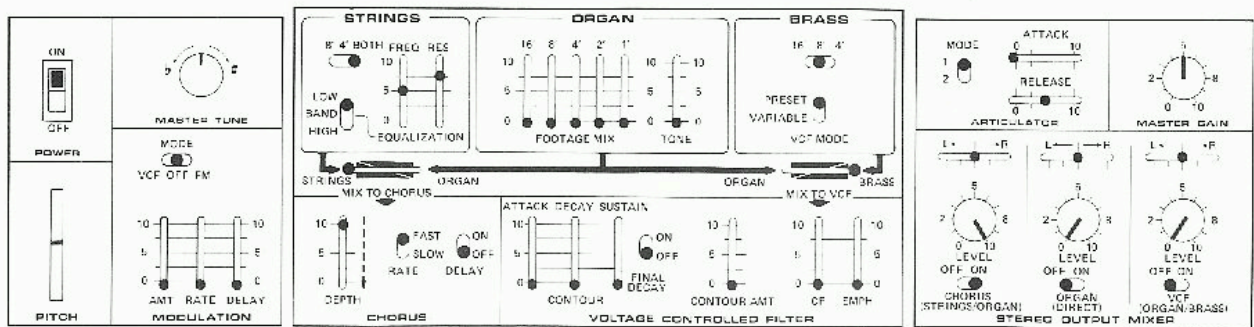
The CHORUS RATE switch determines the overall speed of the shifting movements within the CHORUS effect.
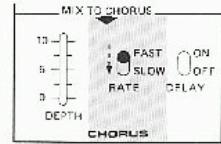
The CHORUS DELAY switch is used in conjunction with the DELAY TIME slider, found in the MODULATION section, to determine the CHORUS effect delay as desired.
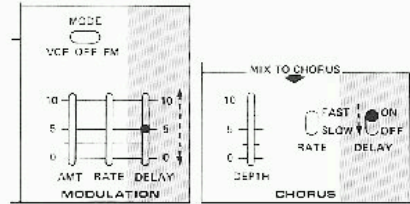
The CHORUS section may be used with the ORGAN voice to produce many console organ sonorities.

CONSOLE ORGAN
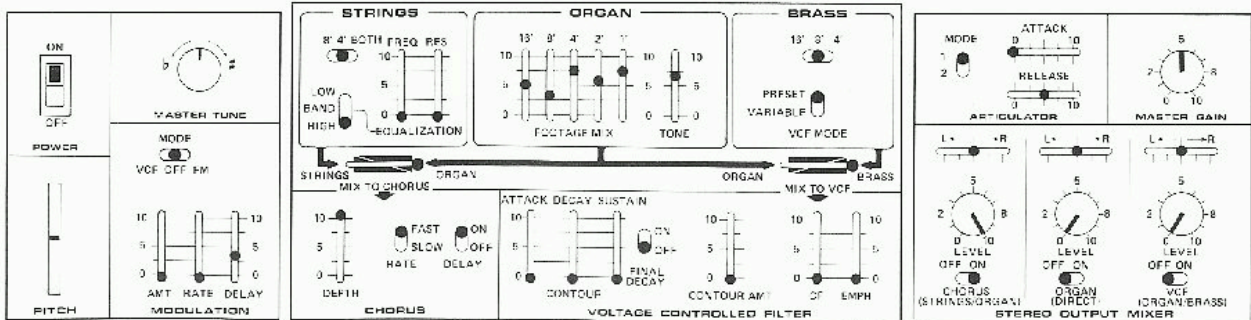
The panning slider above the CHORUS section permits many additional voicings by combining the ORGAN and STRINGS through the CHORUS.

NOTE: When panning ORGAN into the CHORUS, the ORGAN *with CHORUS effect* appears at the CHORUS OUTPUT in the STEREO OUTPUT MIXER. It is also possible to add any amount of *direct* organ voice by increasing the ORGAN output level at the same time and turning "on" the ORGAN (direct) switch.

THEATER ORGAN (with Strings)
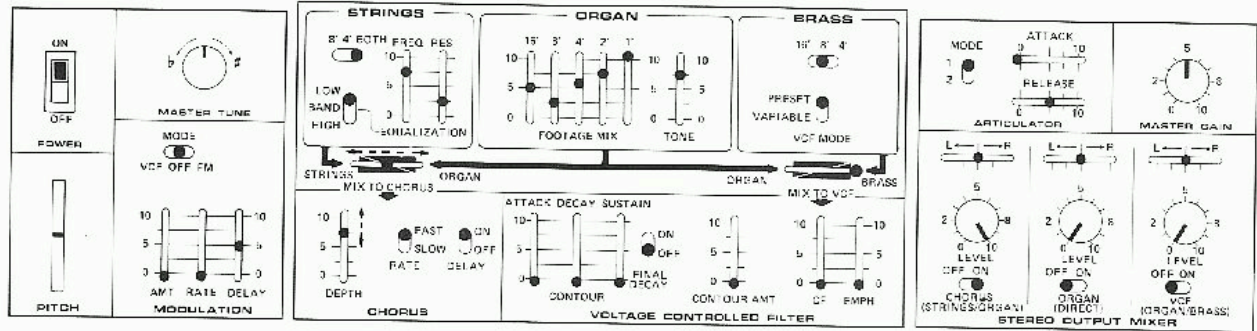
VCF

Probably the most dynamic effects you will achieve on OPUS 3 are those using the famous Moog® VCF. This device, the VOLTAGE CONTROLLED FILTER, is a patented circuit which is the heart of the great Moog sound in all of our instruments.

The following sound chart demonstrates the BRASS voice through the filter. Play your OPUS 3 first with the VCF mode switched to PRESET and again with the VCF mode on VARIABLE.

SYNTH-HORN
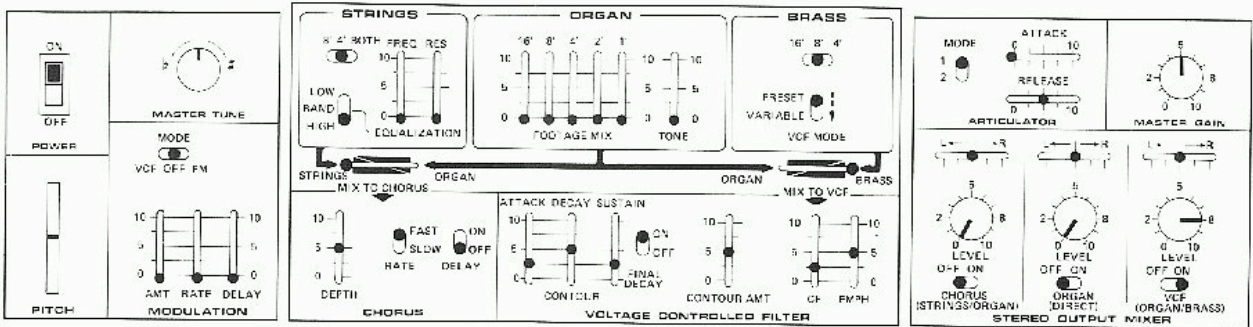
Many alterations to the tone color can be made through the VCF. The most obvious
is a shifting of the cutoff frequency (CF) which adds or removes high frequency partials of the tone.

The emphasis (EMPH) slider adds to the effect of the CF slider by making the filtering more resonant.

Set up the following sound chart:
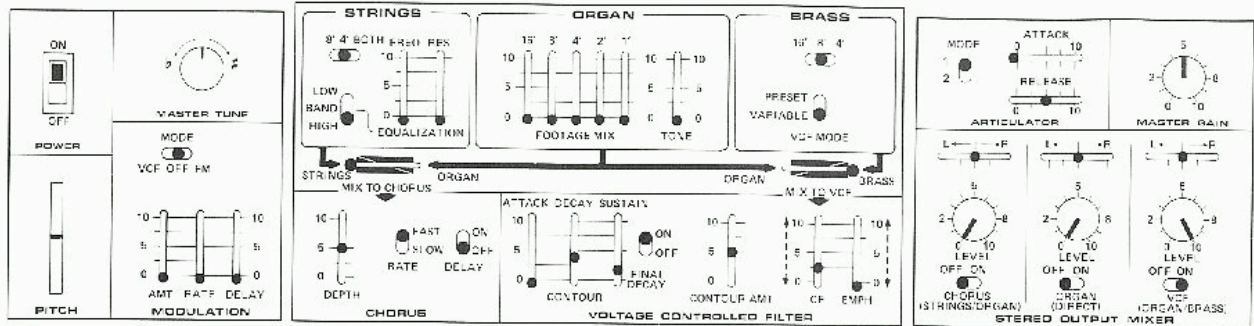
Now move the CF slider down to 0 and up to 10. Note the effect. Return the slider to 2.5.
Raise the EMPH to 7.5 and repeat the same movements of the CF slider.
Note the effect.

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The three sliders in the left portion of the VCF constitute the CONTOUR GENERATOR. This CONTOUR is internally wired to control the cutoff frequency (CF) whenever the filter is in the VARIABLE mode. The CONTOUR AMT slider determines *how much* of the CONTOUR will actually affect the CF.

1. A CONTOUR is generated each time a key is depressed after the release of all other keys.

2. The amount of effectiveness of that CONTOUR is determined by the CONTOUR AMT.

3. The CF of the filter is shifted automatically by the CONTOUR.

FRENCH HORNS
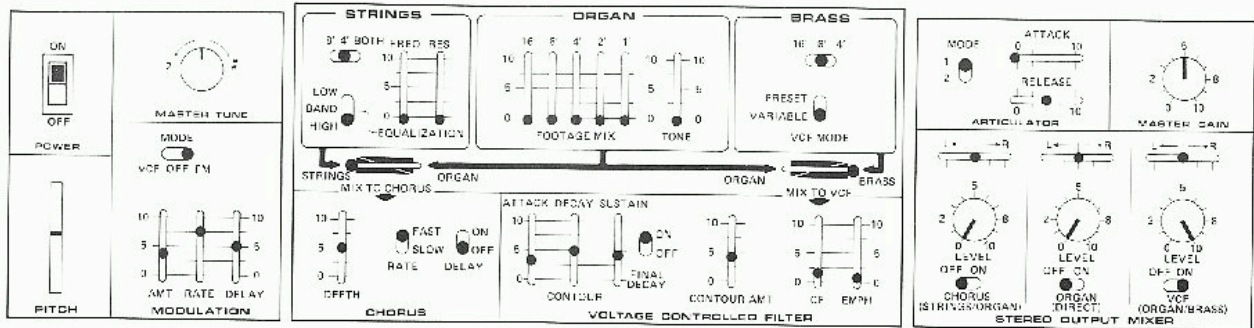
In this voice, the characteristic horn sound is obtained by delaying the ATTACK portion of the filter CONTOUR. An additional "warmth" is added to the tone by vibrato produced in the MODULATION section (see pages 18 and 19).

NOTE: Place the CONTOUR AMT slider down to 0. Notice the effect this has on the filtered sound.

15

By using the VCF, it is possible to completely alter the quality of the BRASS voice.

In the following sound chart, the filter CONTOUR is set to produce a fast attack and fairly rapid decay. This, in conjunction with the low initial cutoff (CF) and slight emphasis (EMPH), produces an electric-piano quality.

Filter tremolo is added through the MODULATION section to complete this voice (see page 19).

ELECTRIC PIANO WITH TREMELO
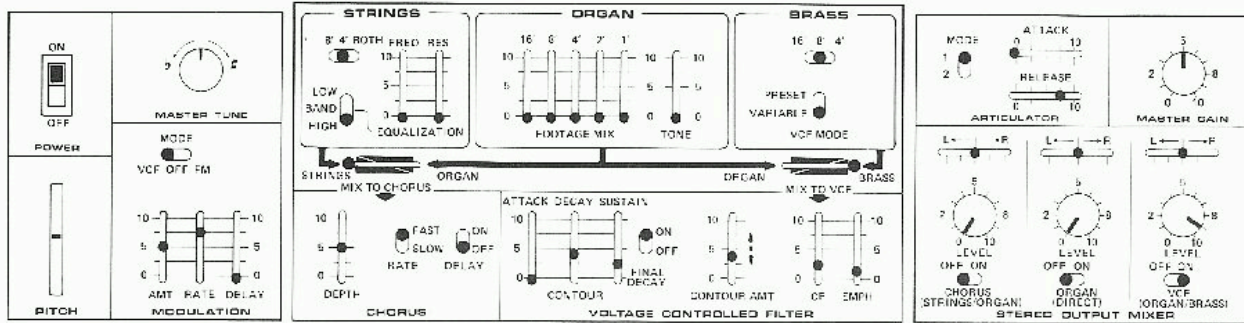
NOTE: CONTOUR AMT is a critical setting. Changing it will greatly affect the "brightness" of the tone.

16

The panning slider above the VCF section permits many additional voicings by combining
ORGAN and BRASS through the VCF.

NOTE: When panning ORGAN into the VCF, the ORGAN with VCF effects appears at the VCF OUTPUT
in the STEREO OUTPUT MIXER. It is also possible to add *direct* ORGAN, *in addition to* CHORUS ORGAN, if desired.

PERCUSSIVE ORGAN
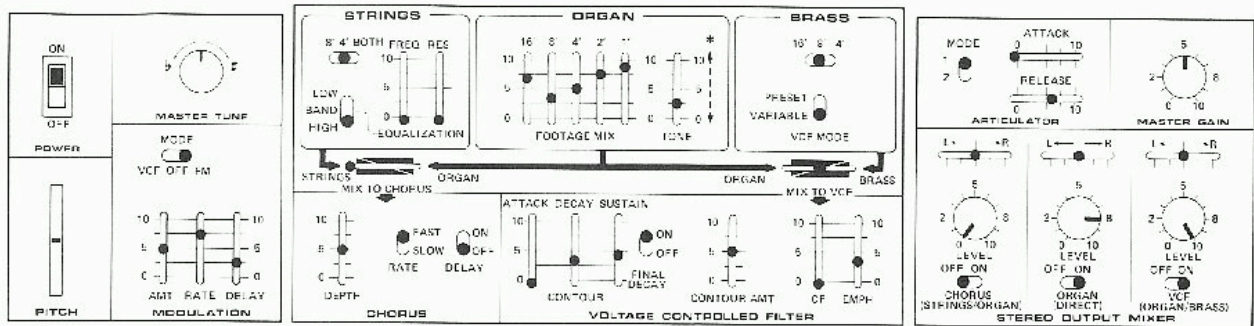
* When ORGAN is routed through the VCF, its tone control will have no effect.
   This allows the full ORGAN sound to be colored by the VCF.

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MODULATION

In synthesis, MODULATION refers to a *repetitive* alteration or change of any voice. The most common form of MODULATION in music is *vibrato*. This is a *repetitive* alteration in the pitch of a note. A second common form of MODULATION in music is *tremolo*. This is a *repetitive* alteration in the loudness and/or tone color of a note.

Another name for *vibrato* is Frequency Modulation (FM). When using FM it is possible to vary the RATE (the speed of vibrato) and the AMOUNT (the width of vibrato).

TROMBONES (with Violin Crescendo Background)

18
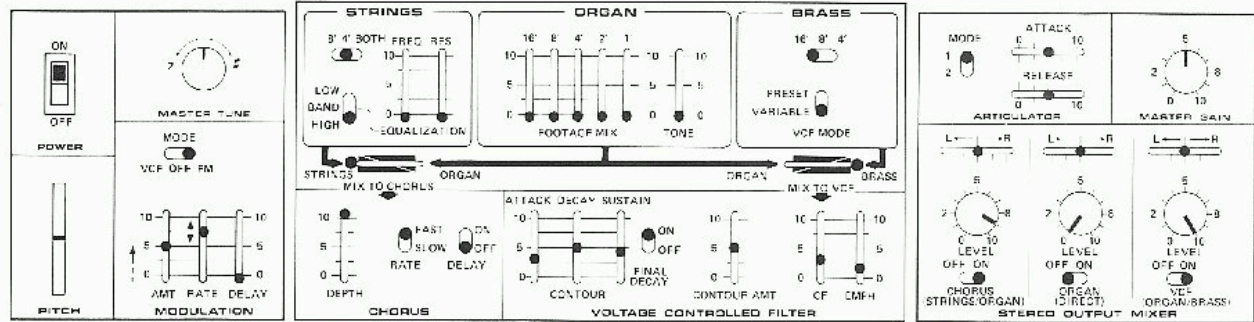
OPUS 3 produces *tremolo* by providing a MODULATION of the VCF cut-off frequency. When using VCF MODULATION it is also possible to vary the MODULATION RATE and AMT.

VIBRAPHONE
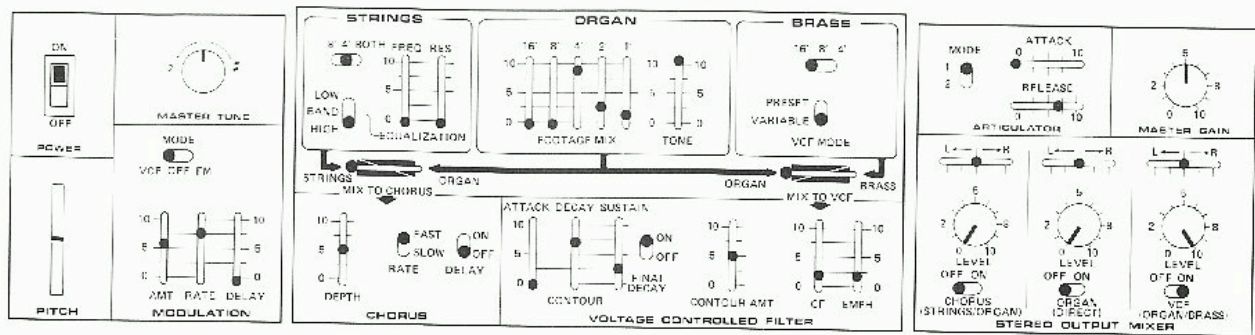
A DELAY TIME in the MODULATION section allows the MODULATION effect to enter gradually after the note is initiated.

COMBO ORGAN (Rotating Speaker Effect)

19
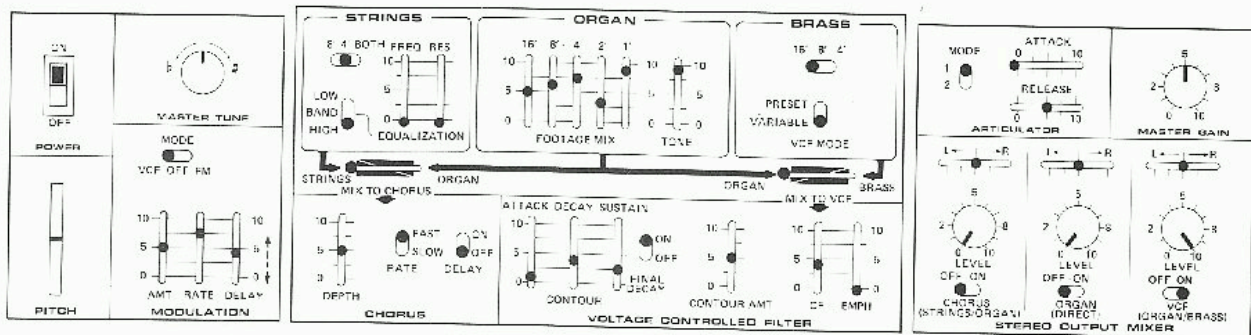
THE ARTICULATION MODES OF OPUS 3

The dictionary defines articulation as "referring to the *clarity of expression.*" In music, articulation is a term applied to the nature of the *attack* and *decay* of a tone or tones, and to the joining of tones to each other.

All acoustical instruments produce tones with particular *articulation* characteristics. In fact, these articulation characteristics are often unique to one particular instrument, many times immediately identifying that instrument to any listener. Obvious unique articulations are the bright attack of a trumpet or the gentle bowing of a legato violin.

The OPUS 3 articulator has three controls which can be used in a wide variety of manners.

ATTACK and DECAY (RELEASE) refers to what is in electronic music called the *envelope* or *loudness contour* of the tone generated. Each is a measurement of time. ATTACK is the amount of time taken before a tone reaches its maximum loudness. RELEASE is the amount of time *after your finger leaves the key* before the tone no longer is heard.

The *envelope* produced by the OPUS 3 articulator may be represented by the following diagram:

KEY IS DEPRESSED   KEY IS RELEASED

DURATION OF
FULL VOLUME

ATTACK   RELEASE

DURATION OF NOTE

20
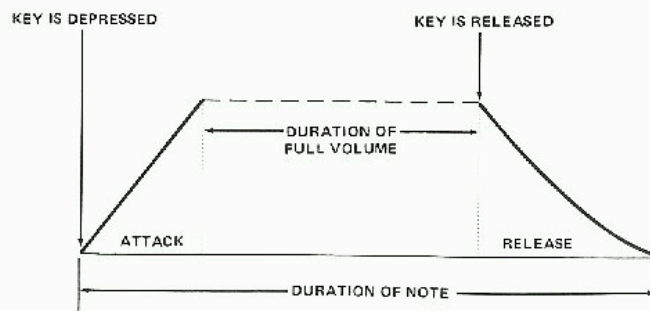
In the following sound chart, the distinctive articulation of the violin is duplicated. Note the effect of shortening or lengthening the attack and release times. Experiment freely.

VIOLIN SECTION
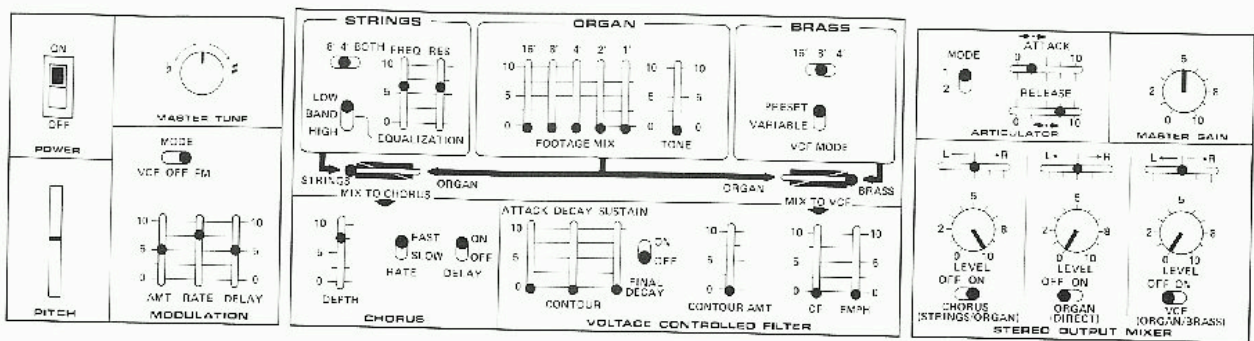
The articulation mode switch has two positions:

MODE 1. In this mode, each note played is re-articulated and any previously decaying note is cancelled. This effect may be represented by the following diagram:

AMPLITUDE (LOUDNESS)

KEYS ARE DEPRESSED AT EACH OF THESE POINTS
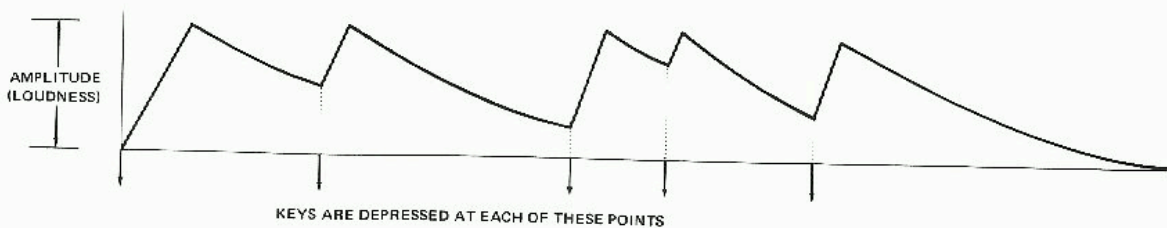
This mode is best used for solo string voicing and most general playing situations with OPUS 3.

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When articulating BRASS and ORGAN voices through the VCF, you will notice that, in MODE 1, the *attack* time is independent of the articulator and always begins with the depression of the key.

If the VCF MODE is switched to PRESET, the articulator sliders will have *no effect* on the tones produced. This will allow a totally separate "layering" of voices, as shown by the following sound chart:

ORCHESTRA (Trombones and Organ Attack, "Hot" Strings Crescendo)
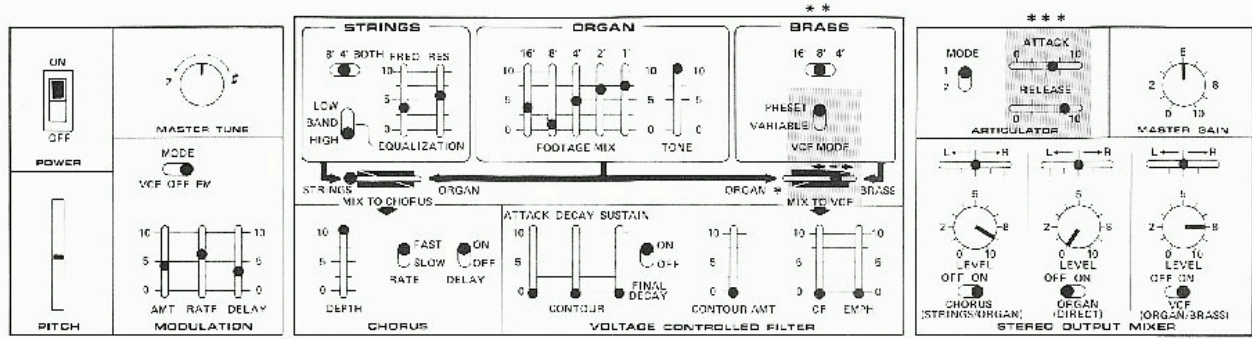
* Mix of Organ to Brass is variable
** Brass and Organ (VCF) articulation preset
*** Violin articulation is controlled here

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In the VCF section, the FINAL DECAY switch functions *only* when the filter is in the VARIABLE mode. When the switch is "on" it is possible to achieve *separate* filter decay settings as long as the ARTICULATOR RELEASE TIME is longer than the VCF CONTOUR DECAY TIME.

Set up the following sound chart and experiment by turning "on" and "off" the FINAL DECAY switch in the VCF. Note the effect this has on the articulation.

CAT AND MOUSE

23
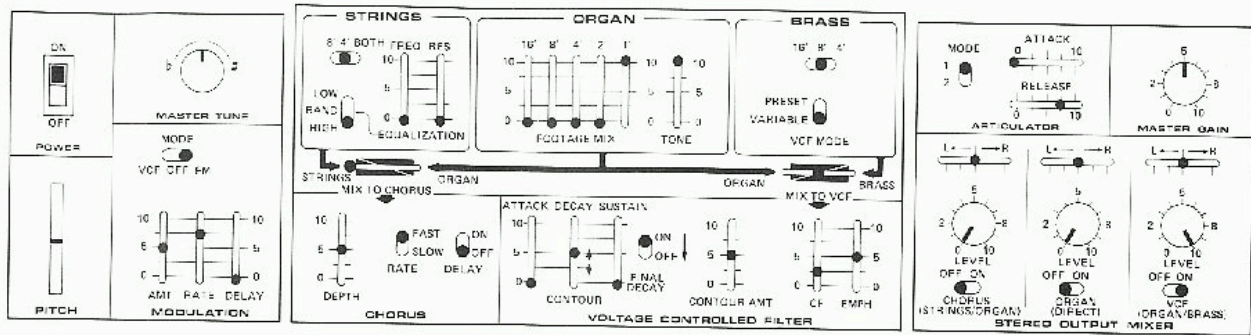
MODE 2. In this mode, which may be called an "overlapping" mode, the striking of a new note does *not* cancel the decay of a note previously struck. In MODE 2, the ATTACK time affects all three output sections.

The usual effect of playing in ARTICULATION MODE 2 is quite similar to playing a piano with the sustaining pedal held down.

CASCADES
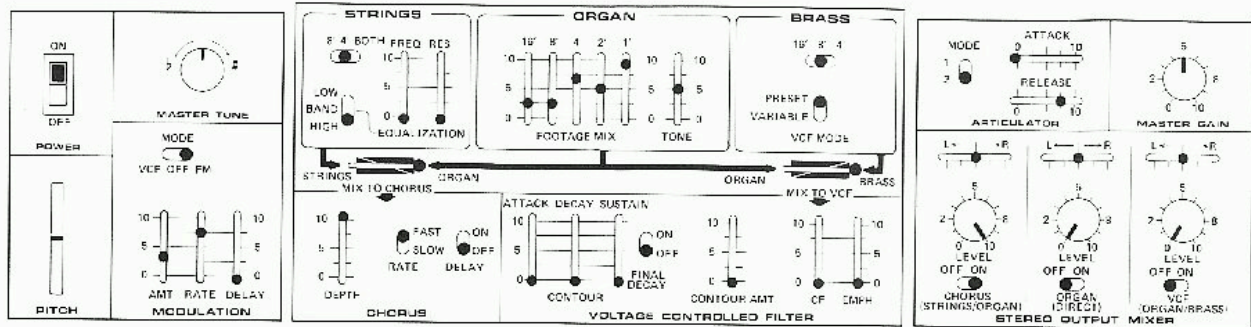
NOTE: For best results with this kind of a voice, play arpeggiated chords, glissandi, fast scales or other "cascading" effects.

An interesting feature of ARTICULATION MODE 2 is its unconditional memory of release time *even when you no longer can hear the note!*

This can be created when a voice is routed through the VCF, and the VCF contour is set to produce only a short tone.

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In the following sound chart, a short and percussive tone is produced. It lasts only a fraction of a second.
The ARTICULATION RELEASE (MODE 2) is set at maximum however, (about 6 seconds),
and when any new notes are played before the first one has decayed entirely, the original tone will be
retriggered at a loudness proportionate to its level during the decay cycle.

AUTO-CHORD

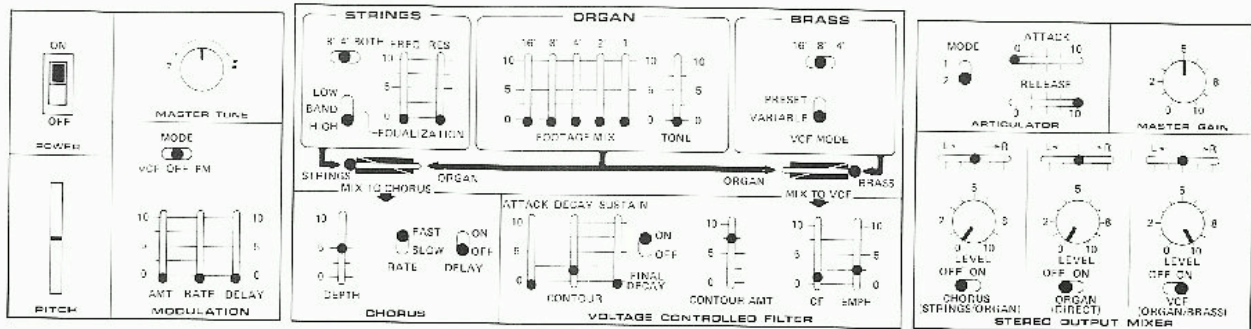NOTE: Play the notes of a C major chord (or any other) *individually* starting with low C and proceeding,
one note after the other, for two octaves. Note the effect. Now reread the above three paragraphs
on ARTICULATION MODE 2. Do you understand the concept? With practice, this effect
can be quite usable to you.

On the rear panel of OPUS 3 there is an input for a Moog 1121A foot switch.
This may be used to externally turn ON/OFF the release function of the ARTICULATOR.

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OPUS 3 AS A POLYPHONIC SYNTHESIZER

By now, you realize that OPUS 3 is far more than a "string machine" or a simple ensemble keyboard.
It is a complex and widely variable polyphonic synthesizer which happens also to produce standard ensemble sounds very easily.

The following four sound charts are examples of synthesizer voicings. They make no attempt to reproduce STRINGS, ORGAN or BRASS, but instead use those basic voices as starting points for experiments in pure sound.

You should note that the VCF, the MODULATION section and the PITCH bend wheel are extremely important in creating these voices.

MINIMOOG
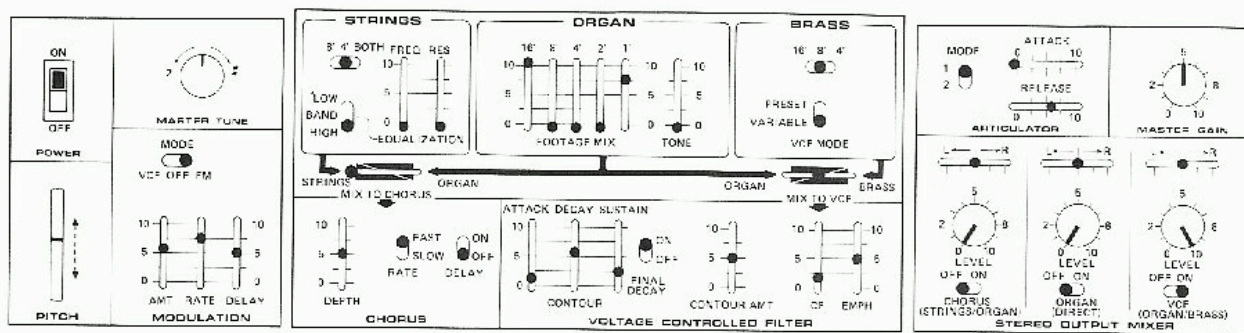
The sound of the "classic" Minimoog is duplicated by combining the 8' BRASS voice (a sawtooth waveform) with the 16' and 1' ORGAN voice (square waves).

Both are mixed into the VCF with a characteristic synth-like setting. Note the effect obtained by the delayed FM Modulation. This is a strong lead-line voice when played monophonically.

For pitch-bending effects, use the PITCH WHEEL with your left hand while playing lead lines with your right hand.

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SHIVERS
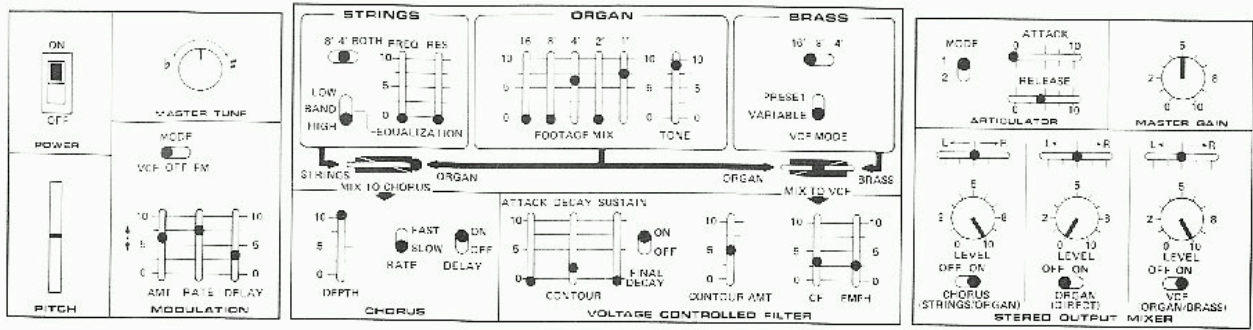
The ORGAN and BRASS voices are again mixed into the VCF to shape the "attack" portion of this voice, and it is followed by a tremolo sustained effect created by a combination of the two ORGAN footages (4' and 1') through the CHORUS while the low BRASS note (16') is modulated in the VCF.

THE OMEN
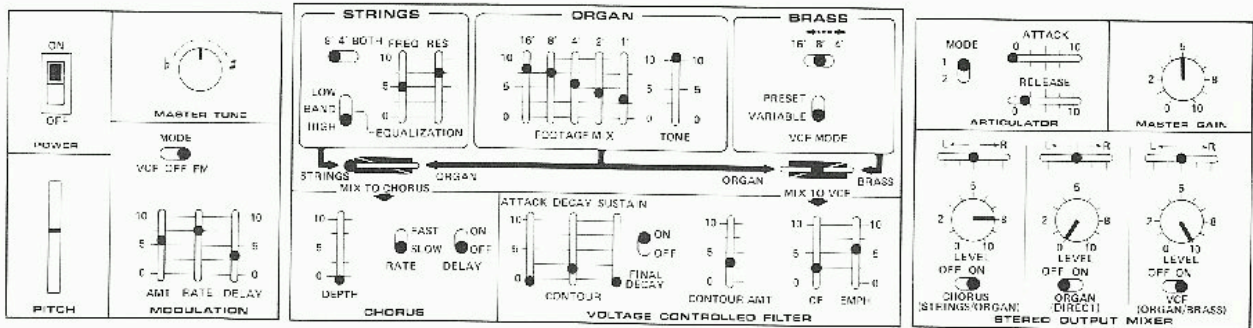
Compare the effect of switching the BRASS footage from 8' to 4' in this voice.

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THE PHANTOM OF THE OPERA
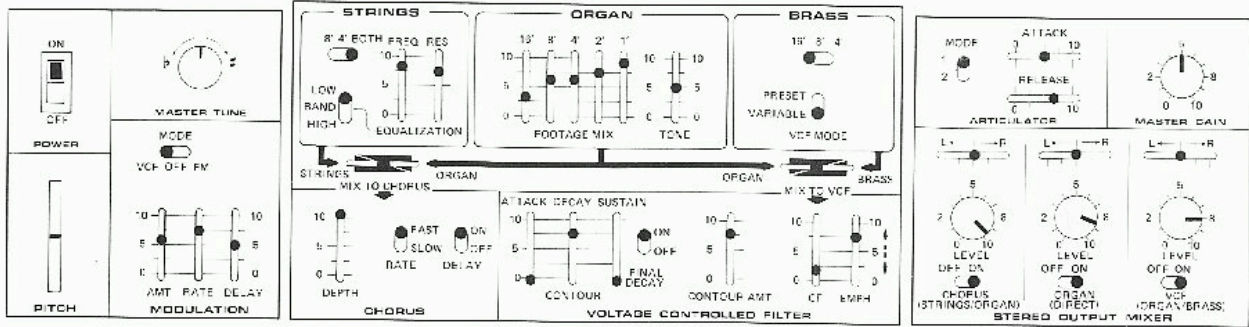
On this voice, the EMPHASIS on the filter is raised to the point where the filter creates its own sound (self-oscillation). As the filter CONTOUR decays, this oscillation is swept from a high to a low pitch. Notice what occurs when the EMPH slider is moved downward.

STEREO OPERATION OF OPUS 3

If you have two amplifiers or are using your OPUS 3 for recording in stereo, you will discover some powerful possibilities of sound placement using the STEREO OUTPUT MIXER.

Connect the left and right stereo outputs on the rear of OPUS 3 to separate amplifiers or to the left and right inputs of a stereo amplifier.

The sliders directly above the input loudness level controls will "pan" the sound between left and right.

25
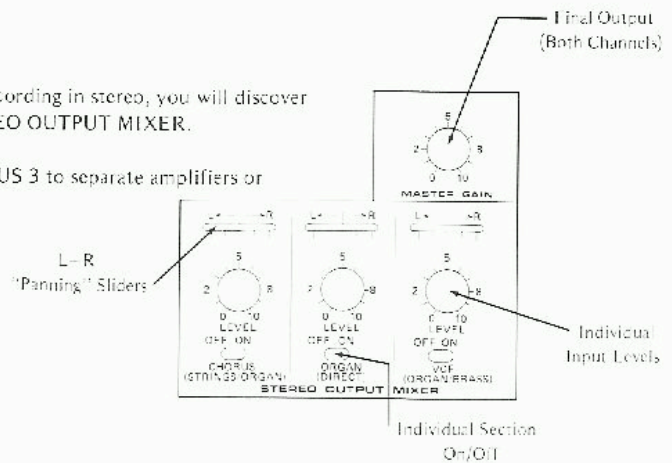
It is now possible to create a number of very powerful stereo effects in "real time" performance. These include:

    a) Placement of individual voices into one amp or another.

    b) Combining one or more voices in any proportion in both amps.

    c) Panning sounds back and forth between both amps while playing.

Experiment with sound placement and the placement of your amplifiers when performing. Remember, each room you play will have its own unique acoustical properties. If used carefully, stereo performance can be highly advantageous!

PRESET SOUNDS

The on-off switches in the STEREO OUTPUT MIXER will enable you to preset sounds.

Set up a desired voice in one of the three output sections.

Set up another voice of contrasting nature in either of the remaining output sections.

Set up a third voice in the last output section.

Use the on-off switches to select sounds as presets.

CONCLUSION

OPUS 3 is a most unusual instrument. It is simple to grasp yet highly complex in its variability.

OPUS 3 has been designed with careful attention to the needs of the musician and engineered to place emphasis on those aspects of music that have always been in the foreground of Moog instrument design:

    Performance

      Expression

        Musicality

          Reliability

            Sound

We wish you many years of success and pleasure with OPUS 3.

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SPECIFICATIONS

Power Requirements:

Operating Voltage Range
Domestic (Model 339A)   95 to 130 volts 60Hz
Export (Model 339BX)   190 to 260 volts 50Hz

Power Consumption: 20 watts

Tone Generator

Reference frequency, high A, 16' = 440Hz
Stability (drift):   less than .02% per $^{\circ}$C

Controllers:

Keyboard: 49 note, C to C, Polyphonic
Master Tune Control Range: +/- 3 semitones
Pitch Wheel Range: Greater than +/- perfect fifth
Modulation Oscillator Waveshape: Sinusoidal
Modulation Oscillator Rate: from .18 to 18Hz
Amount of Modulation: Variable
FM (Oscillator): +/- 3 semitones minimum
VCF (Filter):   10 octaves
Modulation Delay: from 20mS to 20S

Chorus:

Input Mixer: Continuously variable from strings to organ
String Footages: 8', 4', both (8' and 4')
String Waveform: Sawtooth
String Equalization: Low, band and high pass
Equalization Frequency: From 150Hz to 12kHz
Resonance: Variable
Chorus Control: Depth (Variable), Rate (Fast: 6.5Hz or
Slow: .73Hz)
Animation can be delayed, same as modulation

Organ:

Footages: 16', 8', 4', 2', 1' with separate level controls
Waveform: Square wave
Tone Control:
Type: 2-pole variable Lowpass Filter
Cutoff Frequency: from 150Hz to 15kHz

Voltage Controlled Filter:

Type: 24dB/octave lowpass
Input Mixer: continuously variable from organ to brass
Brass Footages: 16', 8', or 4'
Brass Waveform: Sawtooth
Filter Mode: Preset or variable
Cutoff Frequency: 30Hz to out of audio range
Emphasis: Variable from none to regeneration mode
Range of Filter Cutoff Control: 10 octaves
Maximum Sweep of CF by Filter Contour Generator: 8 octaves
The Filter Contour Generator controls the Cutoff Frequency of the
filter through an attenuator:
Range of Attack Time: from 0 to 5.5 sec.
Range of Decay Time: from 0 to 8.7 sec.
Sustain Level: from 0% to 100% of contour peak

Articulator:

Modes: "Cancelling" and "Overlapping"
Range of Attack Time: from 0 to 20 sec.
Range of Release Time: from 0 to 6 sec.

Stereo Output Mixer:

Master Gain Control for three sound paths:
Chorus (Strings/Organ) — coded orange
Organ Direct — coded green
VCF (Organ/Brass) — coded yellow
Separate pan, level and on/off controls
Typical full output level: 0dBm
Signal/Noise Level better than 80dB
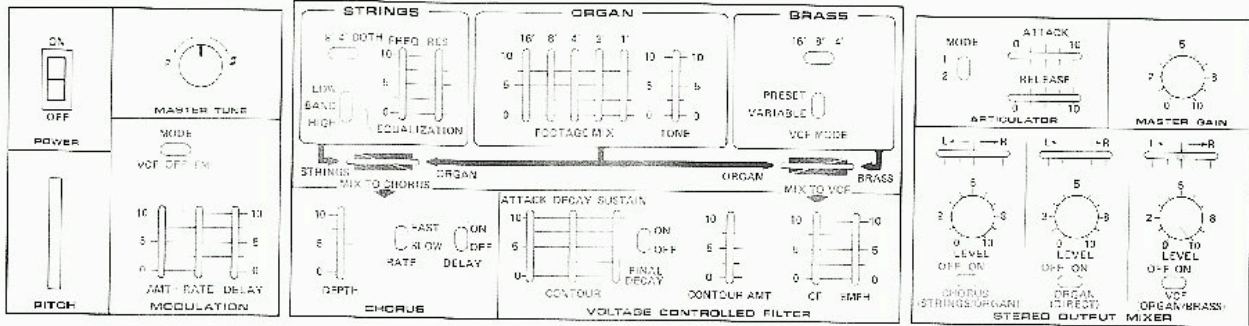Nominal Output Impedance less than 5K ohms

Rear Panel:

Left and right stereo outputs
Mono output
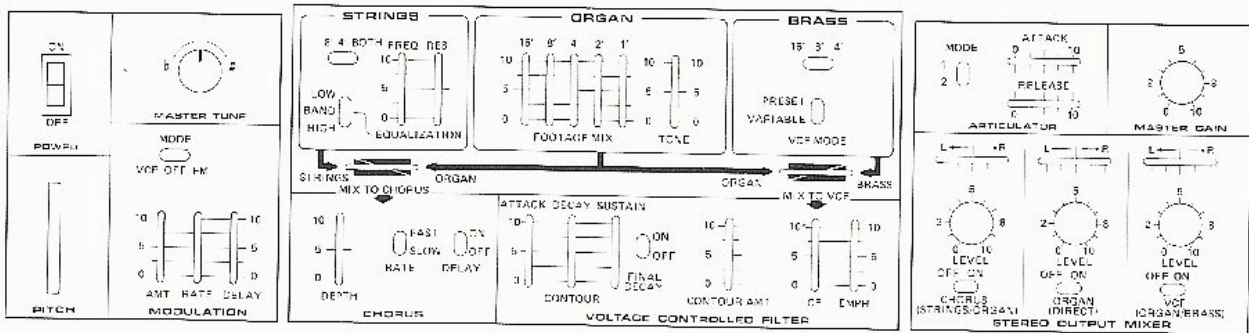Sustain Foot Switch Input (normally closed)

Physical Dimensions:

Overall Size: 5-5/8" high x 14-15/16" deep x 29-3/4" wide
(14.3cm x 37.9cm x 75.6cm)
Net Weight: 20 lbs. (9kg)

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