

# Behringer Pro-1 Operation Guide

An Alternative Manual

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# Introduction To This Guide

## Why This Guide?

The Behringer Pro-1 is a great synthesiser, but is delivered with little documentation. The original Pro-One that the synthesiser is based on had a more detailed explanation, so in learning how to use the Pro-1, the author was using this manual. This document is an effort to consolidate that information and add other relevant information in one concise and clear guide.

Information here is provided without warranty or liability. Please forward any suggestions or corrections by email to [topcat@coolcatukes.com](mailto:topcat@coolcatukes.com).

## Conventions & Naming

This guide is transcribed and adapted from the original Sequential Circuits Pro-One Manual. It has been adapted to cover both the Behringer Pro-1 clone.

The original Pro-One synthesiser had a keyboard. Where “keyboard” is mentioned, then MIDI input is normally implied for the Behringer Pro-1. This MIDI input may be from a Digital Audio Workstation (DAW) such as Logic Pro or directly from a MIDI keyboard controller.

The synthesisers are referred to as Pro-One or Pro-1 where they are mentioned specifically.

## Safety Instructions

For statutory information & safety instructions refer to the Quick Start Guide supplied by the manufacturer with the Pro-1.

# About the Synthesisers

## The Sequential Circuits Pro-One

The Pro-One was a monophonic (one-voice) keyboard synthesiser, now out of production. Its principal sound sources are two voltage-controlled oscillators (VCOs), referred to as OSC A and OSC B. OSC A, OSC B, and a white noise source can be mixed into the resonant low-pass filter (VCF). The filter modifies the voice timbre under control of its four-stage envelope generator. The filter may also serve as a sound source. This stage is followed by a voltage-controlled amplifier (VCA), which shapes the voice amplitude also under control of a four-stage envelope generator. The keyboard provides frequency control voltage (KYBD CV) for the oscillators and filter, and generates a GATE which controls the envelope generators.

In addition to this basic voice, the Pro-One has extensive modulation provisions. Three modulation sources are available: the filter envelope generator (FILT ENV), OSC B, and a separate low-frequency oscillator (LFO). Each can be mixed and routed for either DIRECT or WHEEL-controlled modulation of five destinations: OSC A frequency (FREQ), OSC A pulse-width (PW), OSC B FREQ, OSC B PW, and filter frequency (FILTER).

This complement of analogue synthesiser modules and the routings provided for their interconnection have been well-proven in the Pro-One's ancestors, the Prophet-5 and Prophet-10 polyphonic synthesisers. Besides allowing the synthesist to play up to five or ten notes at one time, these two instruments contain microcomputers which program all the control settings comprising a sound. The Pro-One is neither preset nor programmable: you

always "patch" the precise sound you want with the knobs and switches on the control panel. But the Pro-One voice itself is identical to a single Prophet voice, so it is capable of as much range and expression.

Possessing the Prophet's sound and all standard monophonic synthesiser features, the Pro-One's own microcomputer makes possible innovations unheard of on a low cost synthesiser; a 40-note sequencer, an arpeggiator, keyboard modes such as single- or multiple- triggering, and the unique automatic glide feature. An audio input with preamplifier and automatic GATE generator allows synthesiser processing of low-level inputs such as a microphone or electric guitar. The audio output can drive a monophonic or stereo amplifier, or stereo headphones.

## The Behringer Pro-1

The Behringer Pro-1 is essentially the same as the original Pro-One, but without the keyboard. Generally controlled directly by a MIDI keyboard, or from (or via) a computer connected by USB or MIDI interface.

# Introduction

Follow the guide in the Behringer user instructions to connected the Pro-1 to your computer or MIDI keyboard.

The Pro-1 synthesiser offers extraordinary capabilities for spontaneous control of pitch, timbre, and loudness. To exploit these capabilities fully, learn as much as you can about it with this guide and the books listed in the Appendix. Additional references can be obtained from the more extensive bibliographies contained in the sources listed. Thus prepared, you will no doubt create many interesting sounds. Be advised that the best patches tend to disappear if not documented. Panel blanks for this purpose are provided at the back of this guide.

Remember that the Pro-1 is a sophisticated instrument. It should be handled with as much care as you would give a violin. Shock or vibration can damage the switches and knobs. If you expect to transport the Pro-1 regularly, we recommend that you invest in a professional "flight" case for it. These are made by several manufacturers and should be carried by your music dealer.

## Connections

The Pro-1 is supplied with an external mains adaptor which converts the mains voltage to 12 volts. This is not fused nor earthed. Check that the adaptor is suitable for your mains supply before use. Only use the recommended Behringer adapter.

This is an excellent time to think about your amplifier and speaker system. By converting the synthesiser's electrical output to the potent vibrations you hear, your sound system becomes part of the instrument. Of course you can use anything you like. But if your speakers are muddy and weak, so will be your sound. Using your home stereo will generally give you good high-frequency range, but if you go this route be careful. The Pro-One has much more dynamic range than the typical stereo source. It can generate powerful transients which can damage component speakers if the volume is set too high. Therefore, you might consider using amplifiers and speakers specifically designed for electronic instruments.

The AUDIO OUT is a standard stereo phone jack, but it accepts a stereo or mono plug. For single-channel use with instrument amplifiers, a mono cable with mono plugs at both ends should suffice. For playing through both channels of a stereo amplifier, you will probably need a stereo cable with a stereo phone plug at one end and two phono plugs at the other. These will connect to the amplifier AUX or TAPE inputs. (To protect speakers, it is customary to switch off the amplifier when making these connections.)

A 6.35mm line out is also provided at the rear panel, this is more typically used to connect audio interfaces, PA systems etc.

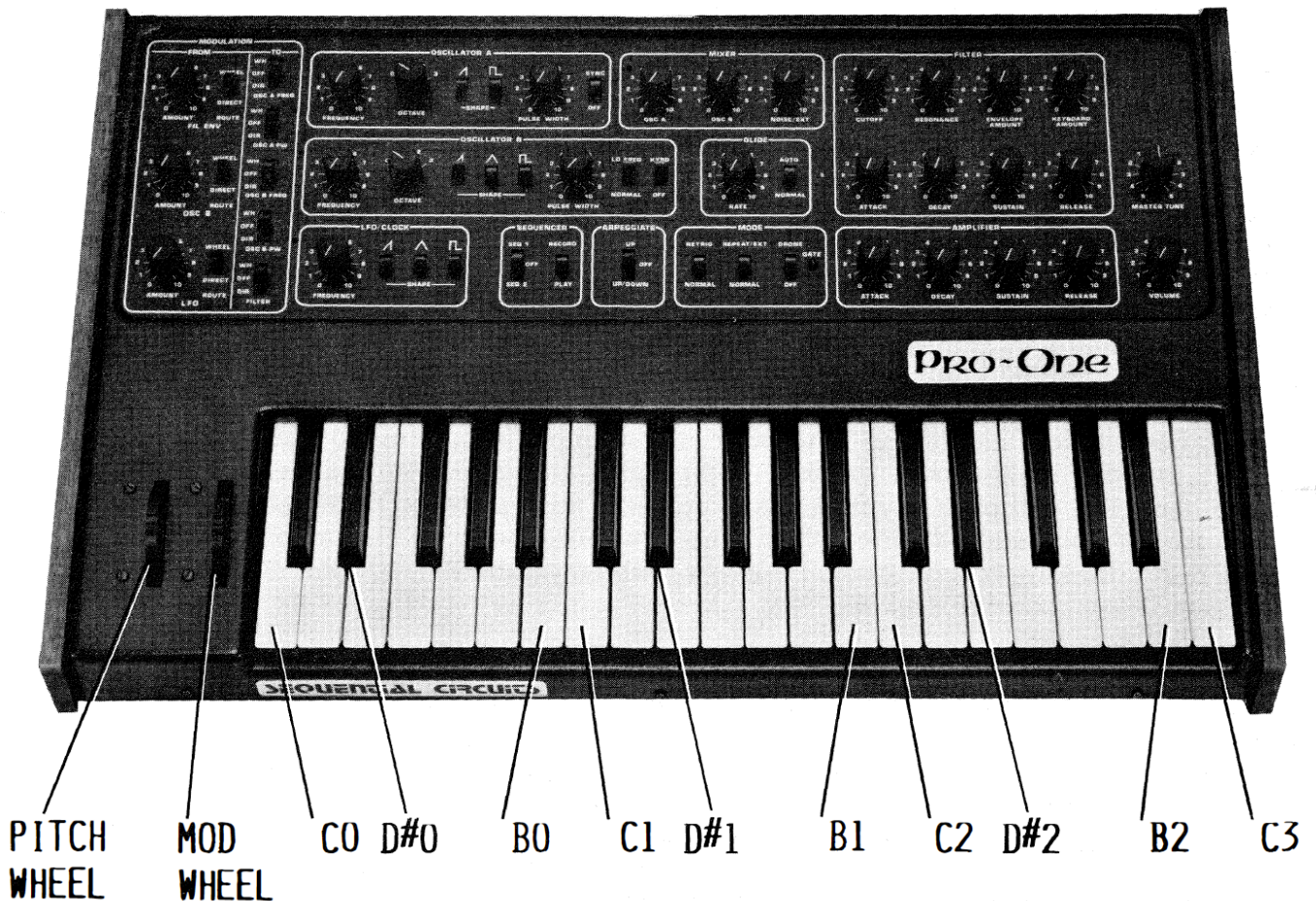
Stereo headphones can be plugged directly into the AUDIO OUT jack. The headphones should have a minimum impedance of 600 Ohms.

When power and audio output connections have been made, first switch Pro-1 power on with back panel switch sited next to the DC input jack socket, then switch amplifier power on. If you think the Pro-1 may not be operating, see the section titled "In Case Of Difficulty" in this guide.

For other back panel connections, see the appropriate section later in this guide.

# Playing

At this point (after unpacking) the Pro-1 is probably not ready to play. As a non-preset synthesiser, the knobs and switches on the control panel have to be set purposefully. Certain minimum conditions such as mixer volumes, filter cutoff frequency and envelope sustain level need to be established. You can learn about the controls by reading Section 2. But if you are like most people, you'll want to try the Pro-1 before studying it. To do this, simply turn to the Factory Patch section and select a factory patch. Set the Pro-1's controls as closely as possible to the diagram while playing on an attached keyboard. Note that the Pro-1 has a Poly/Mono switch that isn't shown on those patch diagrams, it won't matter which setting this is on when playing one note at a time. Patching is a fine art: be patient. Note that there is inherent error in the diagrams and some degree of subjective preference as to exactly where the knobs should be set. For completeness, all control positions are diagrammed even though some may have no effect (for example, PULSE WIDTH when the pulse wave shape is switched off.) When oscillator intervals are harmonically related, the FREQUENCY knob(s) will have to be tuned by ear, usually for a minimum of "beating."



The original Pro-One had MOD and PITCH wheels are at the left of the keyboard. The MOD wheel set the modulation level. When not in use the wheel is left "down" and no modulation will occur. When the wheel is advanced fully "up," modulation is maximum. The PITCH wheel is normally left in its centre-detent position, from which it is possible to simultaneously "bend" OSC A and OSC B pitch up or down by about a fifth. An integral part of playing is using the wheels and the module controls (e.g. GLIDE and FILTER ENVELOPE AMOUNT) for



expression through dynamic and timbral variations. Some MIDI keyboard have these wheels, their effect will be the same as the original Pro-One.

The Pro-1 front panel differs with the addition of a MIDI IN socket and synthesiser patch connections to allow connection between sections of the synthesiser or other devices. There is also a POLY/MONO with in the MODE section. Apart from that, the two synthesisers are identical on the top panel.

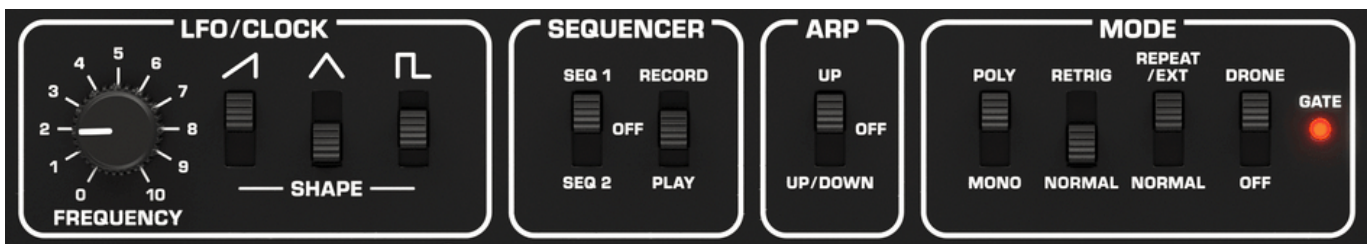
The diagrams don't indicate VOLUME and TUNE knob settings because these are set as required. VOLUME, of course, sets the audio output level to the amplifier or headphones. For optimum signal-to-noise ratio, the Pro-1's VOLUME knob should be set as high as possible (without overdriving your amplifier or speakers, of course). MASTER TUNE simultaneously adjusts OSC A and OSC B pitch over a four-semitone range. It is used to easily tune the Pro-1 to another instrument, such as a piano. Once set, MASTER TUNE is not usually adjusted during performance. If no other instrument is in use, the MASTER TUNE knob should be centred.



Other methods of controlling the Pro-1 are possible via the top panel. For more information, see the top Panel section.

## Keyboard Controls

You can't play chords on a Pro-1 for the same reason you can't play chords on a clarinet or trumpet: they are all monophonic instruments. So you will most often be playing solo lines on



the keyboard. But you have some options as to how the keys are played, and when you can play more than one key. These are the keyboard controls, with which you can experiment on almost any patch. The keyboard controls include the arpeggiator and sequencer, which are



keyboard "memory" devices of great utility in performance. And by freeing both hands from the keyboard, these tools aid in your learning how to patch.

To understand the keyboard controls you first need to know that inside the Pro- 1 a GATE signal is produced when a key is received over MIDI or from the sequencer, which controls the envelope generators. The initial appearance of the GATE "triggers" the envelope generators to proceed through their ATTACK and DECAY periods. After the ATTACK and DECAY periods set for each envelope generator have elapsed, it will produce a steady control voltage (CV) at the level set by the SUSTAIN knob for as long as the GATE is present. When the GATE goes off, indicating the key has been released, the envelope generator output voltage decays to zero at a rate set by the RELEASE knob. (For more information, the Filter section.)

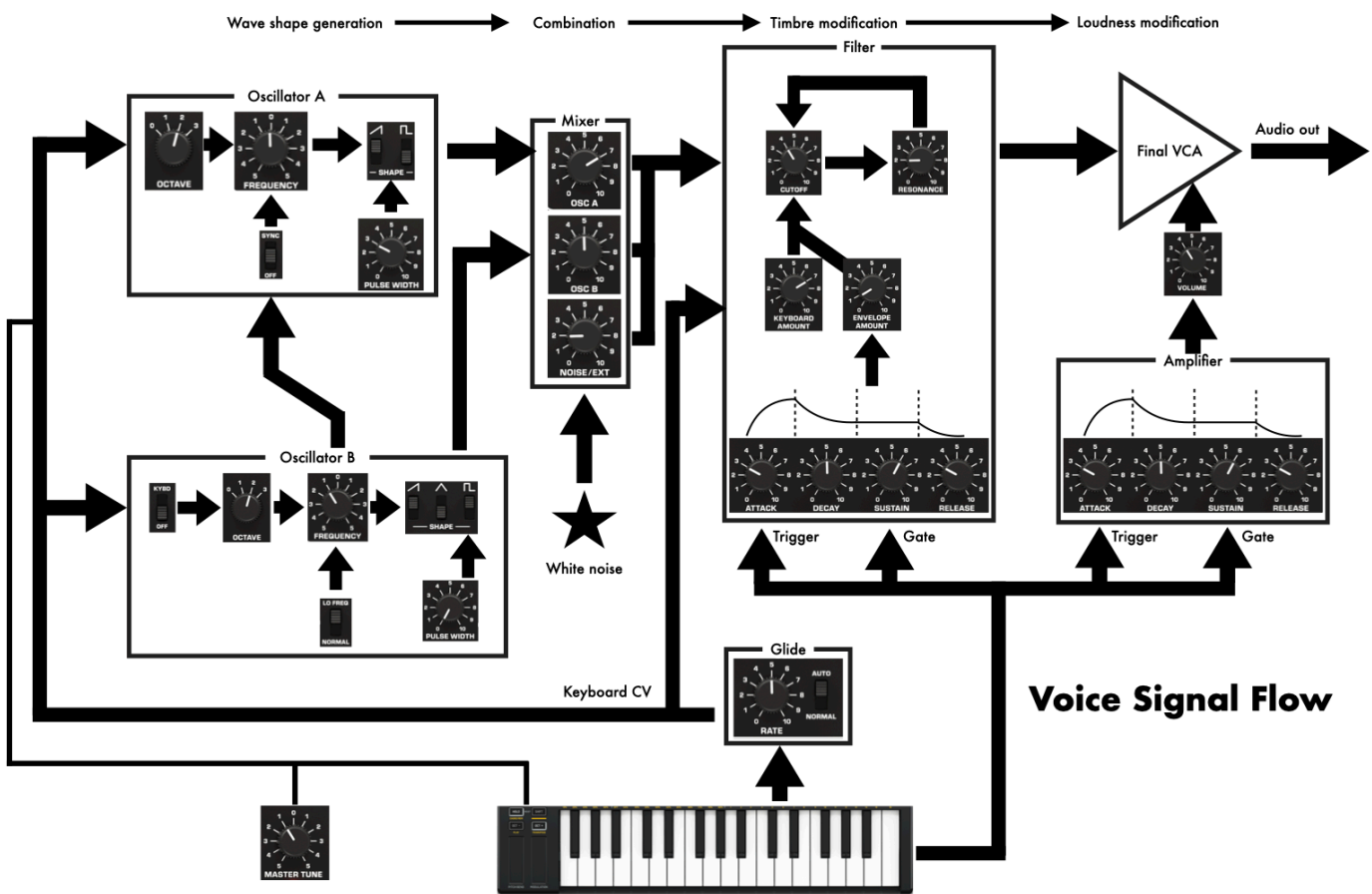
# Front Panel

## Introduction

This section explains the "modules" outlined on the front panel. The front panel is divided into "voice" and "modulation" sections. The basic voice is discussed first, then modulation. Signal flow, the alternatives of each switch, and ranges of each knob are described.

## The Voice

As an analogue voltage-controlled synthesiser voice, the Pro-One can be understood at its most general level in terms of three functions: audio waveshape generation, modification, and control.



The diagram shows the voice signal flow. As mentioned above (About the Pro-One), OSC A and OSC B are the principal sound generators. They are supplemented by the NOISE source (for unpitched sounds such as "surf") or an external audio input which bypasses the NOISE source. (To learn how to use the external audio input, see the Top Panel section).

The MIXER is a modifier. It sets OSC A, OSC B, and NOISE (or EXT audio) levels and combines them into one signal which enters the FILTER. The FILTER also functions normally as a modifier, by cutting off the high-frequency components of input audio signals. However, by feeding a sufficient amount of FILTER output back to its input with the RESONANCE control, the FILTER will become a pitch generator at its CUTOFF frequency.

The AMPLIFIER stage is also a modifier because it raises or lowers the signal level from the FILTER to the external power amplifier and speaker. The AMPLIFIER is controlled by its own envelope generator and the VOLUME control, which attenuates the generator's control voltage output, reducing the overall output level.

OSC A, OSC B, the FILTER, AMPLIFIER, and envelope generators are all voltage controlled. Mechanical devices such as the keyboard, switches, knobs and wheels form one group of controllers. The other group is electronic, consisting of the LFO, OSC B, and FILT ENV modulation sources. The term "modulation" refers to a periodic or consistent (as opposed to random) aural change which is interesting or musically useful. Modulation is created with electronic controllers when it is not possible to adjust a mechanical controller with the required speed or precision. Electronic controllers free the hands for other uses.

The keyboard is the most conspicuous controller. MIDI inputs from it convert to a CV which increases as you play upwards from low notes to high notes. This keyboard control voltage (KYBD CV) always controls OSC A's frequency, and controls OSC B frequency if the OSC B KYBD switch is on. The KYBD CV also controls the FILTER CUTOFF frequency to the extent the FILTER KEYBOARD AMOUNT knob is advanced. The TRIGGER/GATE produced by the keyboard controls the envelope generators, which in turn control the FILTER cutoff frequency and AMPLIFIER gain.

A few controllers also produce GATEs or TRIGGERs which control the envelope generators. For example, when the MODE is switched to REPEAT, the LFO gates the envelopes.

The oscillator FREQUENCY and filter CUTOFF knobs are controllers which set initial frequency over a continuous range. The oscillator OCTAVE switches are controllers which transpose by exact octaves. The envelope ADSR knobs are also, in actuality, control voltage sources.

## Mode

### GATE Indicator

The MODE module contains a GATE indicator light-emitting diode (LED) to clarify operation in the various keyboard modes. And it eases adjustment of the external audio input GATE generator. (For more information, see the Audio In section).

### RETRIG/NORMAL

The NORMAL/RETRIG switch selects the envelope generator triggering mode. NORMAL means low-note priority with single triggering. That is, if you play more than one note at a time, the lowest note on the keyboard will be the one you will hear. Furthermore, all keys must be completely released before a new GATE (initiating new envelopes) will be produced. This allows you to selectively retrigger by touch. When switched to RETRIG (retriggering mode) a GATE will be produced whenever a new key is hit, regardless of its position on the keyboard or of the number of keys simultaneously held. In other words, the last key played will be the one you hear.

### Normal / REPEAT/EXT

When switched up, the NORMAL-REPEAT/EXT switch repeatedly gates the envelope generators at a rate set by the LFO/CLOCK FREQUENCY knob. Activating this switch also enables the back-panel GATE/CLK IN input. When an external GATE is plugged into this

jack, the LFO/CLOCK is overridden and the envelopes will be gated by the external GATE/CLK IN input. This signal will also clock (advance) the arpeggiator or sequencer (see below).

## **DRONE**

The DRONE switch simply forces the GATE on, holding the envelope generators at their SUSTAIN level. DRONE overrides REPEAT. With REPEAT or DRONE on, hitting keys will not retrigger the envelope generators, but it will change the frequency of both oscillators (providing OSC B KYBD is switched up), and of the FILTER, (providing the KEYBOARD AMOUNT knob is advanced). This switch can be useful when setting up sounds.

## **POLY / MONO**

This switch turns on POLY mode when in the upper position. Poly means that if two keys are operated simultaneously, the second is diverted to Oscillator B rather than both going to Oscillator A. If only one key is operated, then this switch has no effect and is the same as operating in MONO mode.

## **Arpeggiator**

The arpeggiator automatically sequences between any depressed keys either UP (ascending only), or UP/DOWN (ascending and descending) the keyboard. ARPEGGIATE speed is set by the LFO/CLOCK FREQUENCY knob. To arpeggiate, select UP/DOWN or UP and hold the desired keys. There is no limit to the number of keys which can be arpeggiated. Set LFO/CLOCK FREQUENCY as you wish. To stop the arpeggiator, return the direction switch to OFF.

The arpeggiator can be "latched," which means it continues to play keys even when you remove your hand(s) from the keyboard. To latch the arpeggiator, first turn it on, hold the desired keys, then switch SEQUENCER PLAY-RECORD to RECORD. After all held keys have sounded at least once, you can remove your hand—the ProOne will continue to arpeggiate. To "unlatch" the arpeggiator, switch from RECORD to PLAY.

You can't change directions in the middle of an arpeggiate sequence. If you do switch from UP to UP/DOWN or vice versa, the Pro-One will wait until all held or latched notes have been arpeggiated in one direction before it recognises the change of direction.

While the arpeggiator is latched, you can hold additional keys which will sound as part of the arpeggiate sequence only as long as they are held. These additional notes remain "unlatched." Note: even though the SEQUENCER RECORD switch is used to latch the arpeggiator, the SEQUENCER memory banks are not affected.

The built in Arpeggiator is activated simply by using the ARP switch. The Pro-1 will take any incoming MIDI or Gate signals and apply it to its built-in arpeggiator algorithm. There are two settings:

- UP - Any incoming notes will arpeggiated from the lowest to the highest note played
- UP/DOWN - Any incoming notes will arpeggiate from the lowest to the highest, then back down to the lowest

The tempo can be controlled using the FREQUENCY dial in the LFO/CLOCK section.

To exit this mode, simply set the ARP switch to OFF.

## Sequencer

The Pro-One's 64-note sequencer allows you to record themes, riffs, walking bass lines or the like. All sequenced notes and rests are single-step recorded with the same duration. The Pro-1 sequencer does not record notes of varying duration. No matter how unevenly you record a Pro-1 sequence, it will always play-back with all notes and rests evenly timed. The playback speed is controlled by the LFO/CLOCK FREQUENCY knob. The 64-note memory capacity is present in two "banks," referred to as SEQ 1 and SEQ 2.

When the Pro-1 is switched on, its sequencer is preprogrammed with an ascending scale in SEQ 1 and a descending scale in SEQ 2. Provided the PLAY-RECORD switch is down, you can now hear these two sequences by just switching the bank selector to SEQ 1 or SEQ 2.

To record, first switch PLAY-RECORD up, then select SEQ 1 or SEQ 2. Simply play the notes on the keyboard, inserting rests by switching from RECORD to PLAY, then back to RECORD. Rhythmic variations can only be arranged by inserting rests. All notes must be played detached, as you would in NORMAL—as opposed to RETRIG-mode (see paragraph 1-4). A sequence cannot begin with a rest.

Be sure to not exceed the 64-note capacity, or the sequence will be destroyed. When the 65th note or rest is entered, the first 64 notes are cleared. The bank then contains one note.

When finished recording, first switch the bank selector OFF, then switch from RECORD to PLAY.

When switched to PLAY, the Pro-One will sequence the notes and rests you recorded in the selected bank at a rate set by the LFO/CLOCK FREQUENCY knob. (Or, the sequencer can be advanced by pulses at the GATE/CLK IN jack. See Top panel section). The sequence will play continuously ("loop") until the bank selector is switched OFF.

The sequencer memory banks will retain their contents until power is switched off (or interrupted). Any transposition is cleared as well.

The Pro-1 has 2 64-step sequencers built in to the device. This accepts incoming MIDI/CV signals and can be recorded and played back internally. This is operated using the 2 switches in the SEQUENCER section.

- Set the first switch to either SEQ 1 or SEQ 2, depending on which slot you want to use.
- Set the second switch to RECORD
- Input your MIDI/CV notes that you want to sequence, up to 64 steps.
- Move the first switch to OFF
- Move the second switch to PLAY
- Move the first switch to your desired Sequence slot. You should then hear your sequence being played

To overwrite a sequence, simply move the second switch to RECORD again. The tempo can be controlled using the FREQUENCY dial in the LFO/CLOCK section.

## Oscillator A

OSC A is an audio frequency source always under control of the MIDI input.

### Frequency Knob

Adjusts initial frequency continuously over a one-octave range.

### Octave Rotary Switch

Transposes initial frequency over a four-octave range.

### Sawtooth Shape Switch

Enables full-level wave shape containing all harmonics. This unmodified shape is often described as "brassy."

### Pulse Shape Switch

Enables full-level wave shape whose harmonic content depends on setting of PULSE WIDTH knob.

If neither wave shape switch is on, OSC A will have no output to the MIXER. If both wave shape switches are on, the sawtooth and pulse are mixed at full level and supplied as OSC A's output to the MIXER.

### PULSE WIDTH Knob

Adjusts the harmonic content of the pulse wave by setting pulse wave duty cycle from 0 to 100%. A 50% duty-cycle pulse, also called a square wave, can be obtained by setting the knob to 5, then carefully adjusting for the dropout of the second harmonic (the first octave overtone). At the extreme knob settings the pulses may "thin out" until they degenerate to dc, resulting in no output signal. This knob has no effect on the sawtooth wave.

### SYNC Switch

Forces OSC A to follow OSC B in hard synchronisation. Intermediate FREQUENCY settings will produce unusual timbres at the next lower harmonic of OSC B. When a wide-width pulse is selected for OSC A in sync with OSC B, and OSC B's frequency is set much higher than OSC A, the signal from OSC A may degenerate to DC since the pulse is not given a chance to discharge before being resynced.



## Oscillator B

OSC B is similar to OSC A, except that in addition to being a keyboard-controlled audio frequency source, it can also be a low-frequency, modulation source with or without keyboard control. The identically named controls function as described under OSC A. In addition:



### Triangle Shape Switch

Enables wave shape which is centred at ground so as not to offset modulation destination. When used in the audio range, this shape provides little harmonic energy.

### NORMAL-LO FREQ Switch

Extends OSC B range to sub-audio frequencies.

### OFF-KYBD Switch:

Allows keyboard control or independent operation.

When OSC B is used as an audio source, usually LO FREQ is switched to NORMAL and KYBD is switched on.

## Glide

The GLIDE module is a "lag processor." It sets the rate of change for the KYBD CV. When set to zero, the KYBD CV instantly steps between notes. As the GLIDE knob is advanced, the KYBD CV does not step quickly between the notes, but begins instead to "slew" between them. GLIDE will only operate on Oscillator A.



### Rate Knob

Determines the rate of glide (portamento) between notes.

### Auto/Normal Switch

In NORMAL, Glide operates in the traditional manner. In AUTO, the keyboard will glide only when a new key is hit with the previous key still held. This enables complex, "tuned" pitch bending with one hand.

## Mixer

### OSC A & OSC B Knobs

Set the level of oscillator input to the FILTER.

### Noise/Ext Knob

Sets the white noise level input to the FILTER. Noise is an unpitched source useful for effects such as surf, wind or cymbals. When the top panel external audio input is used, noise is bypassed and this knob sets the level of external signal input to the FILTER.



To get any sound out of the Pro-1, at least one of these three knobs must be turned up (unless the filter is being used as a pitch source).

## Filter

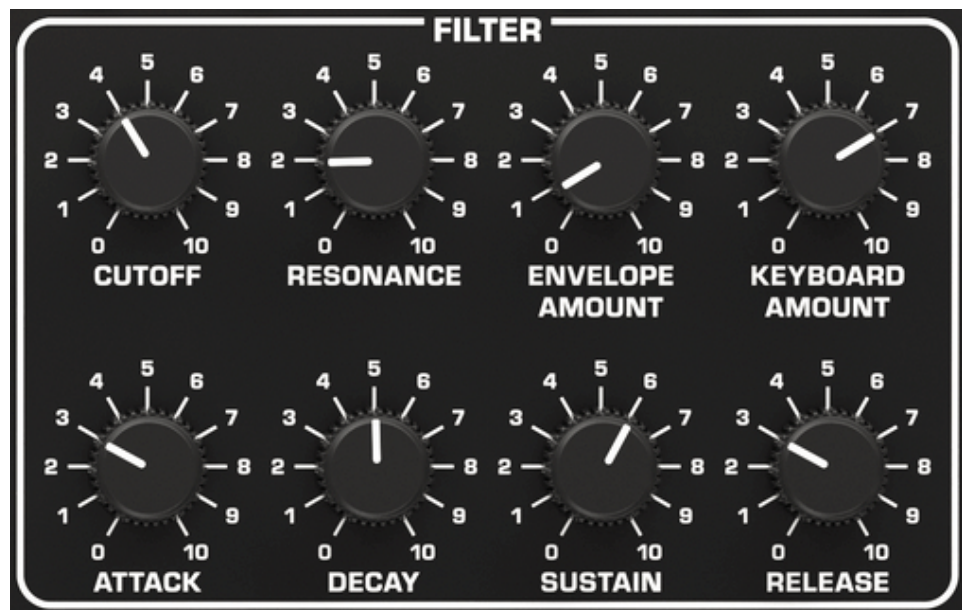
The FILTER module contains controls for the filter itself and for its envelope generator.

### Cutoff Knob

Sets cutoff frequency for the 24 db/octave (4-pole) low-pass filter. It is rather like a tone control. Cutoff is the frequency below which all elements of a signal are let through. The higher-frequency components of the signal (i.e. all those above the cutoff frequency) are suppressed. The higher the knob is set, the higher the frequencies that are allowed through the filter.

### Resonance Knob

Determines the amount of filter resonance. As the setting is increased from 0 to approximately 7 the amount of resonance ("emphasis," "regeneration," or "Q") applied to those signal components at the cutoff frequency will increase. The components far below the cutoff





frequency will be less audible relative to the frequencies being resonated. As the setting is increased beyond 7, the filter breaks into oscillation and will act as a sine-wave audio source whose pitch is determined by the cutoff frequency.

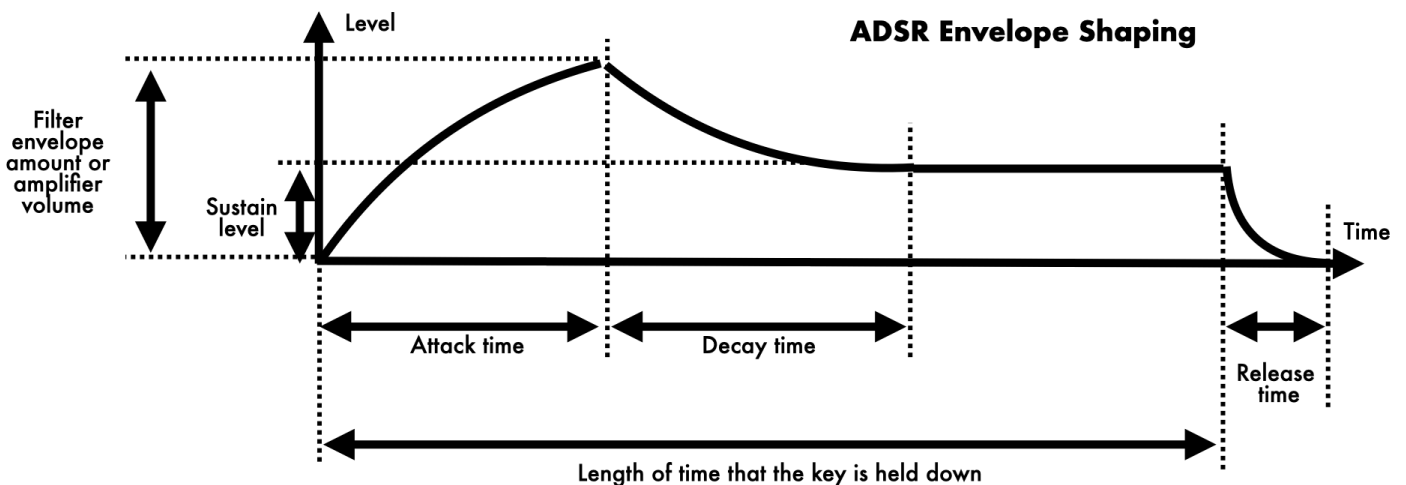
## Envelope Amount Knob

Sets amount (not the shape) of ADSR filter envelope CV controlling the filter cutoff frequency. The filter envelope generator is discussed below.

## Keyboard Amount Knob

Determines the amount of KYBD CV controlling the filter cutoff frequency. When set between 7 and 8, the filter cutoff frequency is maintained at a constant point relative to the notes played on the keyboard, creating consistent tone. When set to 10, notes played higher on the keyboard will have less of their overtones suppressed than those played on the lower end of the keyboard. As a result, the higher notes will have a brighter timbre. When reduced or off, notes played higher on the keyboard will have more of their overtones suppressed than noted played lower. As a result the higher notes will have a duller timbre.

The filter envelope generator contours timbre by controlling the filter cutoff frequency. The entire contour pattern is initiated when a key is struck, producing a GATE. The initial appearance of the GATE "triggers" the envelope generators to proceed through their ATTACK and DECAY periods. After the ATTACK and DECAY periods set for each envelope generator have elapsed, it will produce a steady control voltage (CV) at the level set by the SUSTAIN knob for as long as the GATE is present. When the key is released, the GATE goes off and the envelope generator output voltage drops to zero at a rate set by the RELEASE knob.



## Attack Knob

Varies time for envelope to increase from zero to maximum, from 2 milliseconds to more than 6 seconds.

## Decay Knob

Varies time for envelope to decrease from maximum to SUSTAIN level, from 2 milliseconds to more than 6 seconds.

## Sustain Knob

Varies level from zero to maximum. Remember, this is a level control, not a time control. (SUSTAIN time is the period between the end of the DECAY and when the key is released.)

If SUSTAIN is set at maximum then the DECAY knob setting is irrelevant.

## Release Knob

Varies time for envelope to decrease from sustain level to zero, from 2 milliseconds to more than 6 seconds. If the key is released before either the ATTACK or DECAY periods have elapsed, this knob controls the time taken for the output to drop to zero from its level when the key was released.

If the ATTACK and DECAY periods have elapsed and SUSTAIN is set to 0, the RELEASE knob setting is irrelevant.

## Amplifier

The ATTACK, DECAY, SUSTAIN, and RELEASE knobs in this module shape the envelope applied to the final VCA in the same manner as the corresponding controls in the FILTER module.

Unless the SUSTAIN knob is somewhat advanced, nothing will be heard after the ATTACK and DECAY periods have elapsed.



## LFO

### Frequency Knob

Varies LFO range from approximately .1 to 30 Hz.

### Wave Shape Switches

Function identically to OSC B, although there is no pulse width control for the pulse wave, it is simply a 50% square wave..



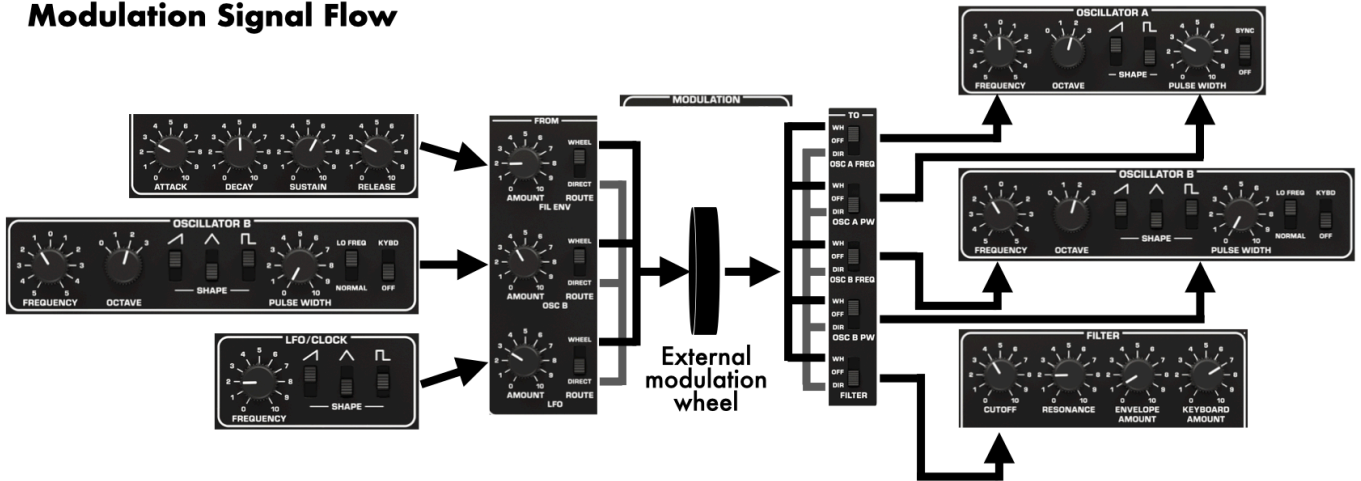
## Modulation

A synthesiser's expressiveness stands on its modulation facilities. The Pro-One has three modulation sources which are fully mixable and routable over simultaneous WHEEL-controlled or DIRECT paths to five destinations in the voice itself. This is where the 'magic' happens.

Two of the three modulation sources (filter envelope generator and OSC B) were described above. The third source is the LFO.

Pay attention to the two sections in the Modulation section. FROM & TO. FROM is where the modulation source is taken from, i.e. the Filter Envelope, Oscillator B or LFO. TO is where that modulation (controlled by the Amount knobs) is directed to. Understanding this principle will help greatly in creating the sounds that you envision.

**Modulation Signal Flow**



**FIL ENV, OSC B, & LFO AMOUNT Knobs**

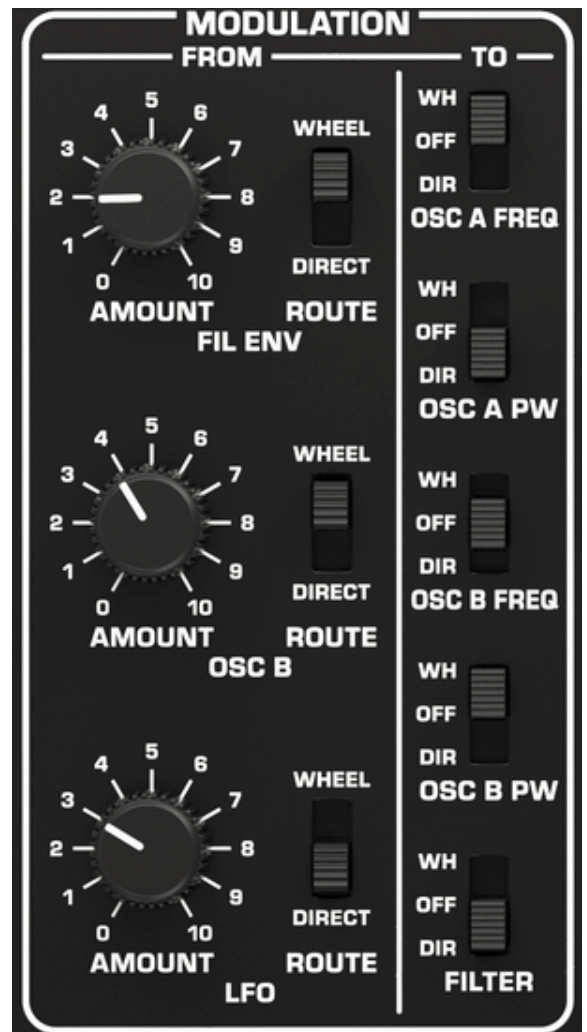
Determine the amount of modulation mixed into the WHEEL or DIRECT paths by the adjacent ROUTE switches. WHEEL refers the the modulation wheel present on many MIDI keyboards. DIRECT applies the modulation directly to the signal and should be used if you don't have a modulation wheel.

**FIL ENV, OSC B, & LFO ROUTE Switches**

Assign the modulation sources to either the WHEEL or DIRECT paths. Each source routed DIRECT is mixed and applied directly to the selected destination, while those routed WHEEL are mixed and then sent to the MOD wheel which determines the depth of modulation.

**OSC A FREQ, OSC A PW, OSC B FREQ, OSC B PW, & Filter Switches**

Select the WHEEL or DIRECT modulation path (or neither) for each destination.



# Top Panel

## Introduction

This section describes all connections which may be made via the top panel jacks. This section is the major difference from the original Pro-One, and consists of 15 jack sockets at the top of the front panel.

On the Pro-One these were Audio out / Audio in / Filter CV IN / Gate Out / CV Out / Gate Clock In / CV IN. These designations are shown in brackets where they are common with the Pro-1.

The functions as either input or output are shown in with < or > respectively.

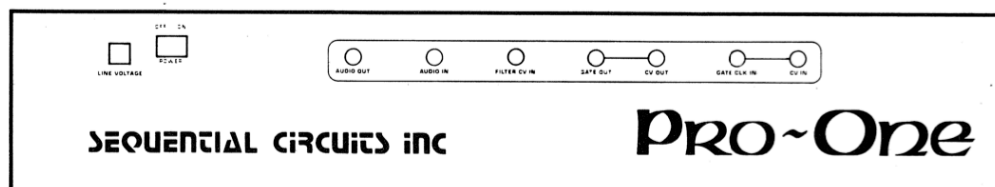


All jacks accept a standard 3.5mm mono jack plug

The original Pro-One had a slightly different layout, with some of these

connections on the rear panel and being 6.35mm sockets.

These connections can be used to make alternative connections within the synthesiser, or to connect other synthesiser units or modules external to the Pro-1.



## Connections

### MOD WH CV <

Input for Mod wheel CV.

### OSC CV (CV In) <

For control of the oscillators and filter at a scale of 1V/octave. Similarly to the FILTER CV IN jack, when connected, CV IN overrides the normal KYBD CV, but may still be switched by the OSC B KYBD switch and attenuated by the FILTER KEYBOARD AMOUNT knob. (For the FILTER, FILTER CV IN overrides CV IN.)

If sound disappears when you connect to this input, you may be driving the oscillators into the super audio range. Reducing the external CV will return the oscillator frequencies to the range of human hearing.

### GATE/CLK (Gate Clock In) <

External Gate or clock input. Once this digital input is enabled by selecting the REPEAT/EXT MODE, it provides for envelope gating, or sequencer or arpeggiator clocking by an external (+5V nominal) pulse.

**LFO CV <**

LFO rate CV.

**LFO OUT >**

LFO out CV.

**KYBD CV > (Cv Out)**

This jack makes the [V/octave KYBD CV available for control of external equipment. It basically ranges 0.083V to 3.083V (three octaves), following the keyboard or sequencer. If the sequencer is transposed (see paragraph 1-6), CV OUT can range -1V to 4V.

**GATE > (Gate Out)**

This digital signal follows the GATE status as indicated by the GATE LED. That is, whenever a note is played on the keyboard or by the arpeggiator or sequencer in playback, GATE OUT will be high (+5V-nominal).

**EXT < (Audio In)**

This jack allows an external audio input to be mixed and processed by the Pro- One's filter and amplifier. The input drives an internal envelope detector which generates a GATE once the input level has passed the threshold set by the MIXER NOISE/EXT knob. The GATE which is produced controls the filter and amplifier envelope generators. This GATE can also advance the arpeggiator or sequencer when these keyboard controls are selected. It overrides both the LFO/CLOCK and the GATE/CLK IN input (see below).

To enable the gate generator, REPEAT/EXT MODE must be selected. The input is very sensitive, being drivable by a microphone or electric guitar pickup. Line- level audio can overdrive the input. The principle for correct adjustment of the GATE generator is to set the MIX NOISE/ XT knob at the minimum level necessary for consistent or adequate gating. Observe the GATE LED for aid in adjustment.

**MIXER >**

Output of the Mixer,

**CUTOFF CV <**

VCF cutoff frequency [input]

**RESO CV <**

VCF Resonance CV.

**FILTER ENV >**

Filter envelope output.

**AMP ENV >**

Amplifier envelope output.

## PHONES >

A stereo 3.5mm headphone socket. Headphone impedance should be no less than 600 ohms.

## AUDIO OUT >

Mono 3.5mm output of the Pro-1. This is functionally the same as the 6.35mm OUTPUT socket on the rear of the unit. This is a high impedance line level output and should be connected to a mixer, audio interface or to an amplifier. DO NOT connect it directly to speakers.

## Top Panel Electrical Reference

Input	Input or	Electrical specification
<b>MOD WH CV</b>	Input	0V to +5V
<b>OSC CV</b>	Input	-5V to +5V
<b>GATE/CLK</b>	Input	>2V to trigger
<b>LFO CV</b>	Input	-5V to +5V
<b>LFO OUT</b>	Output	Triangle +/-2.5V, Pulse +4V, Sawtooth +5V
<b>KYBD CV</b>	Output	0V to +7V
<b>GATE</b>	Output	0V or +5V
<b>EXT</b>	Input	Impedance 85K $\Omega$
<b>MIXER</b>	Output	Unbalanced max +20dBu
<b>CUTOFF CV</b>	Input	0V to +5V
<b>RESO CV</b>	Input	0V to +5V
<b>FILTER ENV</b>	Output	0V to +5V
<b>AMP ENV</b>	Output	0V to +5V
<b>PHONES</b>	Output	Signal output
<b>AUDIO OUT</b>	Output	Signal output

# Back Panel

## Connections

The Back panel houses the DC power input, a MIDI output/through socket, USB connection to allow MIDI over USB, DIP switches to allow the MIDI channel to be configured, Audio out and the power on/off switch.



Bear in mind that when the Pro-1 is switched off, the mains adaptor is still on and consuming power (albeit small). If not using the Pro-1 for extended periods of time, switch off or unplug at the mains supply. This will stop power wastage and also extend the life of the power supply.

## In Case Of Difficulty

To check that the Pro-1 is receiving power check the power light by the Master volume knob is on, then switch DRONE on. The GATE LED should light. If it doesn't, either power is not reaching the unit or the internal fuse has blown. First check the power source by plugging in other equipment. Examine the Pro-1's power adapter for damage.

If the GATE LED lights but no sound can be obtained, check the front panel controls—including VOLUME—carefully against a factory patch in the Factory Patch section in this guide.

If still no sound can be heard, try substituting the audio output cable with one known to be good.

Check your amplifier by trying a high-level audio input such as another synthesiser or an audio interface.

Check headphones by trying them with a standard headphone output from a stereo amplifier.

If the SEQUENCER won't record, check that you didn't leave ARPEGGIATE on.

If you are having trouble recording or playing sequences or arpeggiating, it may help to reset the internal microcomputer by switching power off then back on after a moment. Note this will erase any sequences which you have recorded.

If hum is noticeable or excessive from the audio output, first check that the correct mains adapter is in use, then check output leads. A cable checker such as Behringer's CT200 cable tester may be useful, and can be purchased via this link : <https://amzn.to/3Die3Yp>

# Routine Maintenance

## Introduction

This section covers all maintenance which the player can be expected to perform.

## Cleaning

The external metal surfaces and plastic parts can be cleaned with a damp cloth or a foam cleanser such as Servisol (<https://amzn.to/3dfNAQE>) Don't use alcohol, ammonia, or phosphate-based cleaners. They can remove the paint and ruin the plastic finishes.



# Appendices & Reference

## Selected Bibliography

**Appleton, John** and **Perara, Ronald** The Development and Practice of Electronic Music  
Prentice-Hall, Englewood Cliffs, NJ.

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**Helmholtz, Hermann** On the Sensations of Tone Dover Publications, New York, NY.

**Strange, Allen** Electronic Music William C. Brown Company, Dubuque, IO.

**Wells, Thomas** and **Vogel, Eric** The Technique of Electronic Music Sterling  
Swift Publishing, Manchaca, TX.

Contemporary Keyboard Magazine, 20605 Lazaneo, Cupertino, CA 95014

Polyphony Magazine, Box 20305, Oklahoma City, OIC 73156

## Acknowledgements

Pro-One images and some text from original Pro-One manual by Stanley Jungleib

Pro-1 Images Courtesy of Music Tribe IP Ltd

Patches provided by Kevin Kent from original Pro-One scanned manual

## Physical Specifications

<b>Power</b>	12VDC, 8W (~700mA) maximum, 2.1mm Barrel Jack, +ve on centre
<b>Weight</b>	1.8kg (4lbs)
<b>Dimensions (H x W x D)</b>	95 x 424 x 136mm (3.7 x 16.7 x 5.4")
<b>Operating</b>	+5 °C to +40 °C (41 °F to 104 °F)

## Glossary / Notes

3.5mm connectors are functionally equivalent to 1/8" connectors

6.35mm connectors are functionally equivalent to 1/4" connectors

ADSR - Attack, Decay, Sustain, Release

CV - Control Voltage

DAW - Digital Audio Workstation

MIDI - Musical Instrument Digital Interface

## Product Links

Manufacturer's manuals can be found and purchases made via these links.

Product	Manufacturer	Amazon
Behringer Pro-1 Synthesiser	<a href="https://www.behringer.com/product.html?modelCode=PODRK">https://www.behringer.com/product.html?modelCode=PODRK</a>	<a href="https://amzn.to/3rzhPKV">https://amzn.to/3rzhPKV</a>
Behringer CT200 Cable Tester	<a href="https://www.behringer.com/behringer/product?modelCode=POBBR">https://www.behringer.com/behringer/product?modelCode=POBBR</a>	<a href="https://amzn.to/3Die3Yp">https://amzn.to/3Die3Yp</a>
Behringer PSU12-UK UK Power supply	<a href="https://www.behringer.com/product.html?modelCode=POAZF">https://www.behringer.com/product.html?modelCode=POAZF</a>	<a href="https://amzn.to/3oou5vC">https://amzn.to/3oou5vC</a>

## Revisions To This Guide

Revision	Date	Notes
<b>1.0</b>	6th December 2021	Added Top Panel Electrical Reference, voice flow diagram
<b>0.2</b>	5th December 2021	Typo revisions, section order, changed heading font size for clarity, re-drew diagrams
<b>0.1</b>	3rd December 2021	Typo revisions, top panel clarifications, front page illustration
<b>0.0</b>	30th November 2021	First draft, work in progress

Be sure to re-visit [www.coolcatukes.com](http://www.coolcatukes.com) to check for periodic updates to this guide.

# Factory Patches

This section contains 20 patches for the Pro-1 ranging from instrumental imitations to sound effects. All sounds are created by setting the Pro-1's controls as diagrammed, then fine-tuning knob settings to your taste.

The diagrams are not meant as absolutes but as examples. The patches should serve as starting points for you to create your own sounds. There is no single, ideal trumpet or bass patch, for example, because the synthesised sound must usually be heard in a musical context of rhythm, melody and harmony. The notes played, their speed, your technique, the voicing of ensemble instruments or soloists, even the acoustical characteristics of the room all influence the perception of many of the knob-set parameters such as pulse-width, envelope settings (ATTACK, DECAY, SUSTAIN, RELEASE), and filter cutoff. The art of patching is the ability to make music with the Pro-1. It takes practice.

These have been reproduced from the original Pro-One manual, so they do not include the Poly/Mono switch.

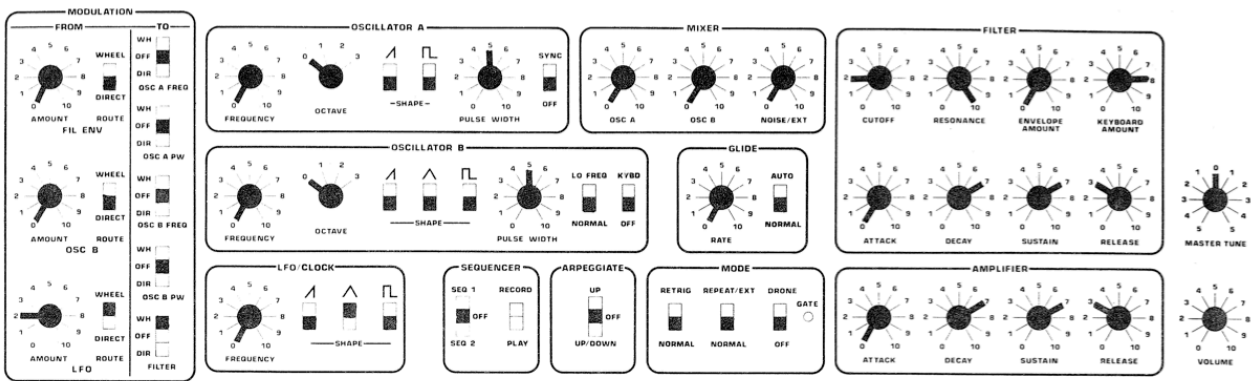
## Solo Trumpet

Try auto-glide. Try adding OSC B's sawtooth-raise MIX OSC B. Advancing MOD wheel gives vibrato. Adjust LFO AMOUNT.

## Frequency Modulation Bells

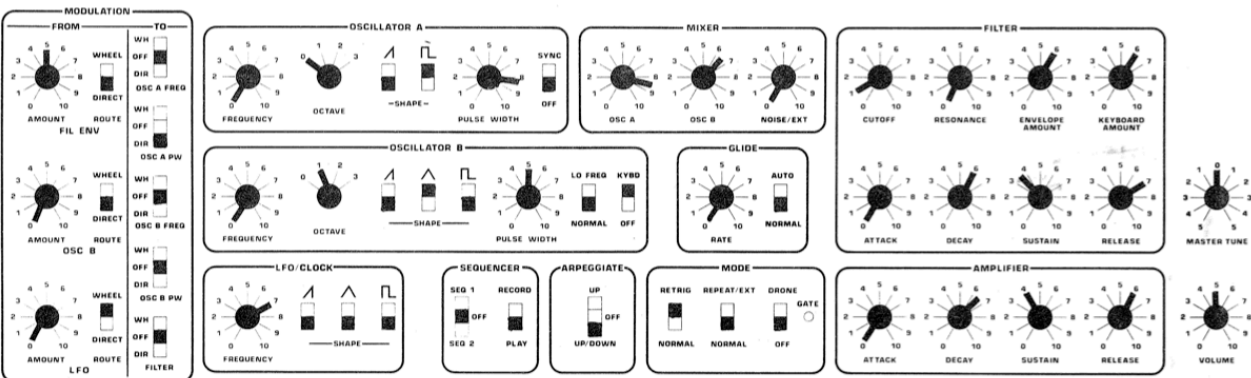
Adjust FILTER RESONANCE and KEYBOARD AMOUNT. MODULATION OSC B AMOUNT sets level of frequency modulation to OSC A.

# Filter as Oscillator



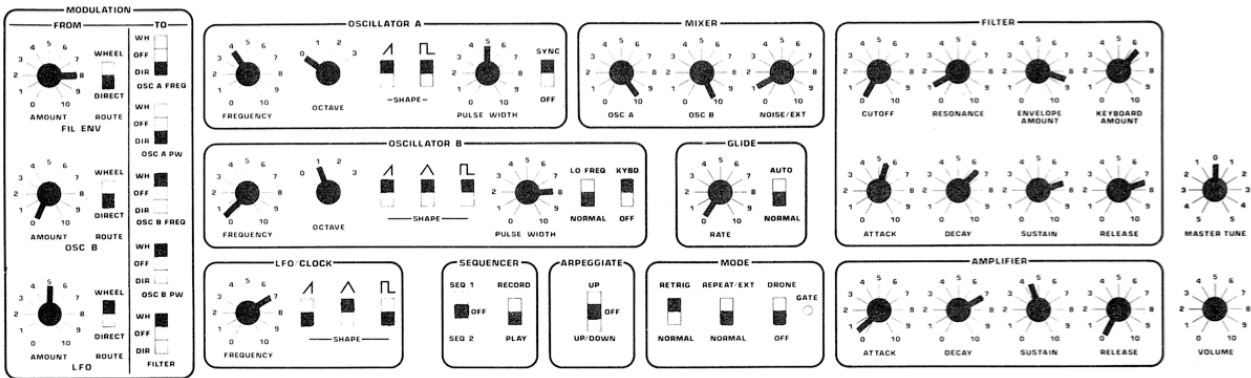
Tune the filter with FILTER KEYBOARD AMOUNT while playing octaves. CUTOFF controls overall range. Advance MOD wheel. Vary LFO rate. Try reducing AMPLIFIER SUSTAIN and adjusting DECAY level. NORMAL GLIDE with a rate of 6-7 plus wheelmodulation gives 1950s sci-fi film sound. Advance FILTER ENVELOPE AMOUNT

# Phunko Basso



Adjust FILTER DECAY, MIX OSC A and MIX OSC B, OSC A PULSE WIDTH, MODULATION FILTER ENVELOPE AMOUNT. Try the SEQUENCER.

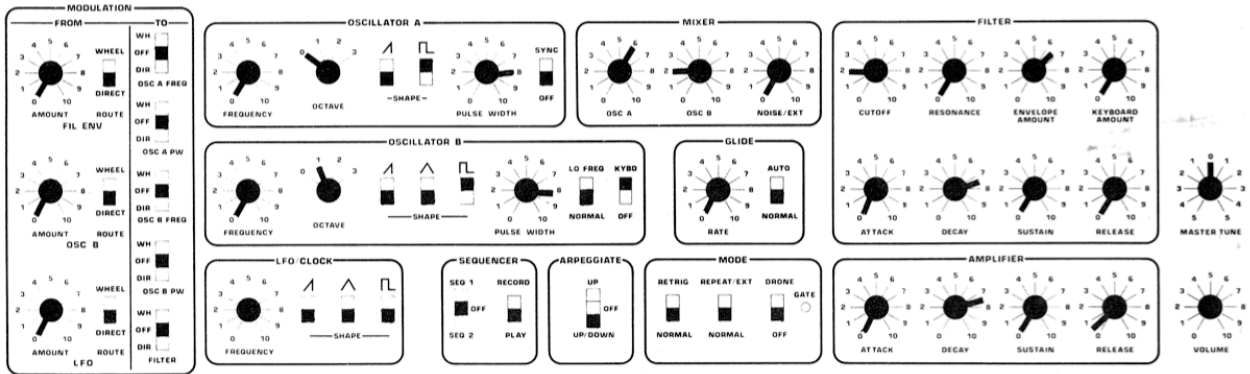
# Grunge Guitar



# Grunge Guitar

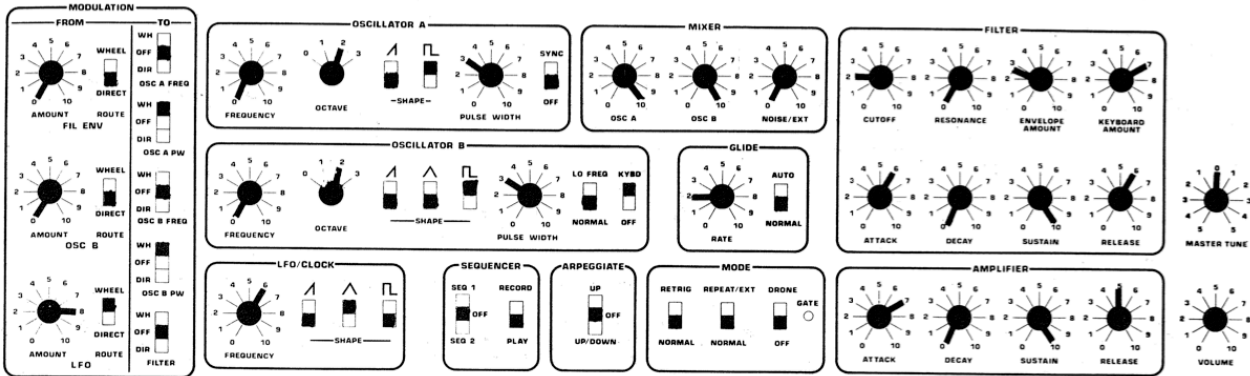
Adjust FILTER ATTACK. It is controlling the sync sweep. Notice there is a little white noise.

# Bass Clav

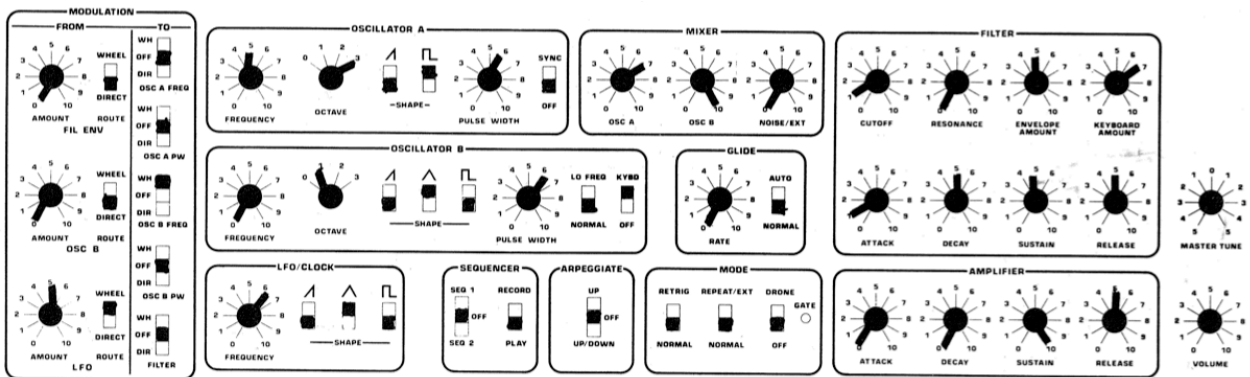


Trim PULSE WIDTHs near 9. Too far clockwise causes pulse to degenerate to dc (no sound). Raise MIXER OSC B and try different OCTAVES. Adjust DECAY times on both envelopes. Try ARPEGGIATE at fast LFO/CLOCK setting.

# String



# Percussive Organ



# Percussive Organ

Tune OSC A 2 octaves plus a perfect fifth above OSC B. For proper effect, adjust OSC A PULSE WIDTH for square wave by listening for disappearance of the octave overtone. FILTER ENVELOPE AMOUNT adjusts brightness of percussive effect. Mod-wheel provides vibrato.

# Single-Engine Crop Duster

The control panel for the Single-Engine Crop Duster includes the following sections:

- MODULATION:** Controls for FROM (WHEEL, DIR, OSC A FREQ, OSC B FREQ, OSC B PW, LFO) and TO (WH, DIR, OSC A PW, OSC B PW, FILTER).
- OSCILLATOR A:** FREQ, OCTAVE, SHAPE, PULSE WIDTH, SYNC.
- OSCILLATOR B:** FREQ, OCTAVE, SHAPE, PULSE WIDTH, LO FREQ, KYBD, NORMAL, OFF.
- LFO/CLOCK:** FREQ, SHAPE.
- SEQUENCER:** SEQ 1 (OFF, RECORD), SEQ 2 (PLAY).
- ARPEGGIATE:** UP, UP/DOWN.
- MIXER:** OSC A, OSC B, NOISE/EXT.
- MODE:** RETRIG, REPEAT/EXT, DRONE, GATE.
- GLIDE:** RATE, AUTO, NORMAL.
- FILTER:** CUTOFF, RESONANCE, ENVELOPE AMOUNT, KEYBOARD AMOUNT, ATTACK, DECAY, SUSTAIN, RELEASE.
- AMPLIFIER:** ATTACK, DECAY, SUSTAIN, RELEASE.
- MASTER TUNE** and **VOLUME** knobs.

First hold one key, a second, then add a third or fourth. Latch the arpeggiator or record sequence. Adjust LFO/CLOCK FREQUENCY. Adjust OSC B FREQUENCY, which is secondary LFO. Adjust AMPLIFIER ATTACK and DECAY.

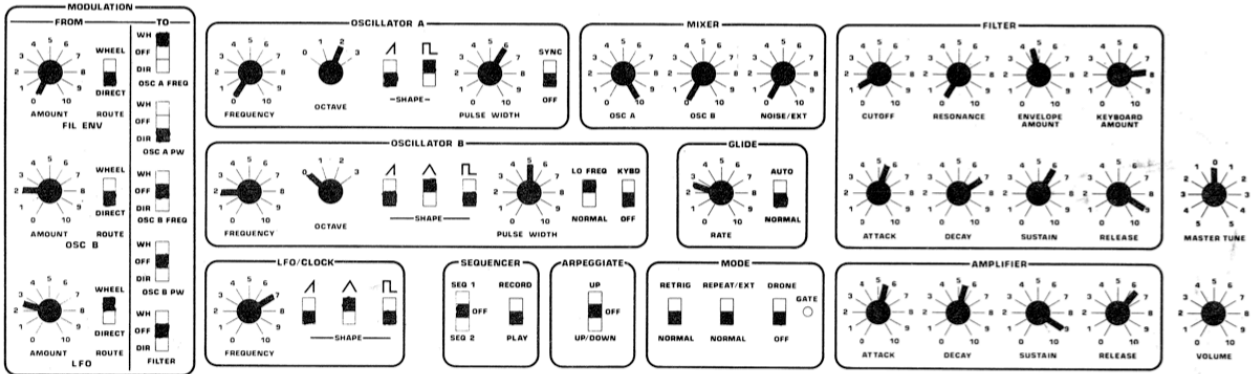
# Sync

The control panel for the Sync mode is identical to the Single-Engine Crop Duster panel, featuring the same sections for Modulation, Oscillators, LFO/Clock, Sequencer, Arpeggiate, Mixer, Mode, Glide, Filter, Amplifier, Master Tune, and Volume.

# Pipe Organ Flute

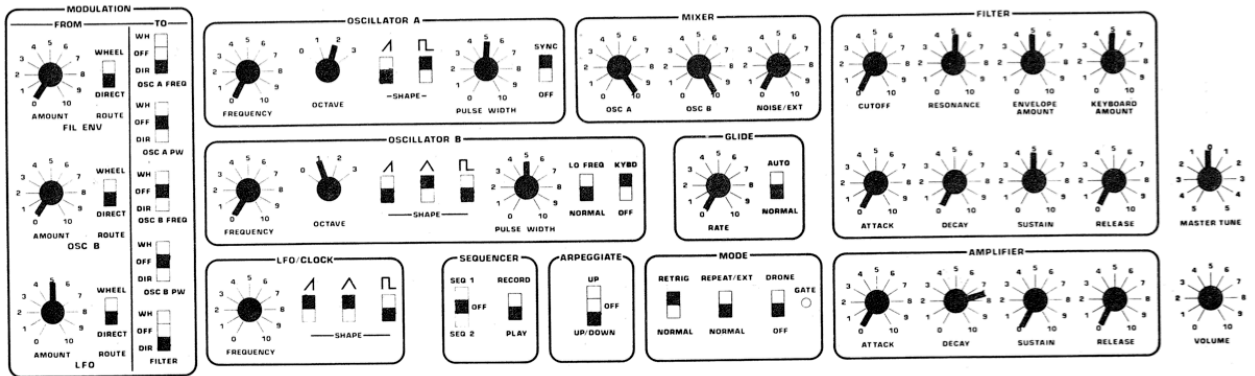
The control panel for the Pipe Organ Flute is identical to the other two panels, featuring the same sections for Modulation, Oscillators, LFO/Clock, Sequencer, Arpeggiate, Mixer, Mode, Glide, Filter, Amplifier, Master Tune, and Volume.

# Clarinet



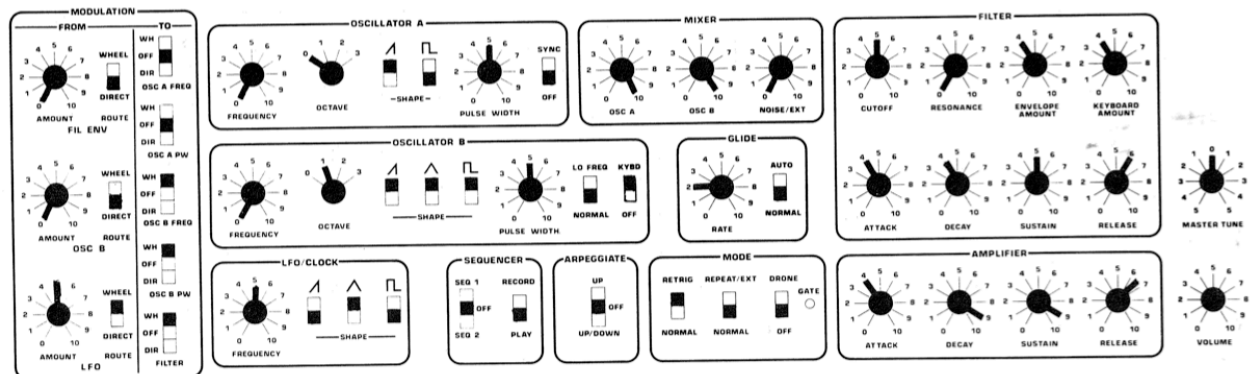
Adjust OSC A PULSE WIDTH for square wave by listening for disappearance of the octave overtone

# "Delayed" Envelope



Uses LFO as an envelope generator. (LFO is reset by keyboard trigger when ARPEGGIATE is switched on.)

# Bass Synth Sustain



Tune OSC A 1 octave below OSC B.

# Psuedo Ring Mod Bells

The control panel for 'Psuedo Ring Mod Bells' features a grid of knobs and switches. On the left, a 'MODULATION' section includes three knobs for 'FROM' and 'TO' (WHEEL, DIR, AMOUNT) and three switches for 'FIL ENV', 'OSC A PW', and 'OSC B PW'. The main area is divided into several functional blocks: 'OSCILLATOR A' (Frequency, Octave, Shape, Pulse Width, Sync), 'OSCILLATOR B' (Frequency, Octave, Shape, Pulse Width, L.O. FREQ, KYBD), 'MIXER' (OSC A, OSC B, Noise/Ext), 'GLIDE' (Rate, Auto), 'FILTER' (Cutoff, Resonance, Envelope Amount, Keyboard Amount), 'LFO/CLOCK' (Frequency, Shape), 'SEQUENCER' (Seq 1 Record, Seq 2 Play), 'ARPEGGIATE' (Up, Up/Down), 'MODE' (Retrig, Repeat/Ext, Drone, Gate), and 'AMPLIFIER' (Attack, Decay, Sustain, Release). A 'MASTER TUNE' knob and a 'VOLUME' knob are positioned on the right side.

# Dynamo

The control panel for 'Dynamo' is identical in layout to the 'Psuedo Ring Mod Bells' panel. It includes the same 'MODULATION' section, oscillator and mixer controls, filter and amplifier sections, and the 'MASTER TUNE' and 'VOLUME' knobs.

Hold C1, D1, E1, F1, and G1. For variation, switch off OSC B pulse or adjust MODULATION FILTER ENVELOPE AMOUNT. Add keys and latch arpeggiator.

# Arpeggiating Fifths

The control panel for 'Arpeggiating Fifths' is identical in layout to the other two panels. It includes the same 'MODULATION' section, oscillator and mixer controls, filter and amplifier sections, and the 'MASTER TUNE' and 'VOLUME' knobs.

Tune OSC A a perfect fifth above OSC B. Play chords. The LFO/CLOCK is controlling the ARPEGGIATOR and filter modulation through the filter envelope. Change FILTER ENVELOPE AMOUNT and RESONANCE.



# Plucked String

The control panel for the Plucked String mode includes the following sections:

- MODULATION:** FROM (WHEEL, DIR, OSC A FREQ, AMOUNT, FIL ENV, ROUTE), TO (WH, OFF, DIR, OSC A FREQ, OSC A PW, DIR, OSC B FREQ, OSC B, WH, OFF, DIR, OSC B PW, LFO, DIR, FILTER).
- OSCILLATOR A:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, SYNC.
- OSCILLATOR B:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, LO FREQ, KYBD, NORMAL, OFF.
- MIXER:** OSC A, OSC B, NOISE/EXT.
- GLIDE:** RATE, AUTO, NORMAL.
- FILTER:** CUTOFF, RESONANCE, ENVELOPE AMOUNT, KEYBOARD AMOUNT.
- AMPLIFIER:** ATTACK, DECAY, SUSTAIN, RELEASE, MASTER TUNE, VOLUME.
- SEQUENCER:** SEQ 1 (RECORD, OFF), SEQ 2 (PLAY, OFF).
- ARPEGGIATE:** UP, UP/DOWN, OFF.
- MODE:** RETRIG, REPEAT/EXT, DRONE, GATE, NORMAL, NORMAL, OFF.

# E-Bass

The control panel for the E-Bass mode includes the following sections:

- MODULATION:** FROM (WHEEL, DIR, OSC A FREQ, AMOUNT, FIL ENV, ROUTE), TO (WH, OFF, DIR, OSC A FREQ, OSC A PW, DIR, OSC B FREQ, OSC B, WH, OFF, DIR, OSC B PW, LFO, DIR, FILTER).
- OSCILLATOR A:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, SYNC.
- OSCILLATOR B:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, LO FREQ, KYBD, NORMAL, OFF.
- MIXER:** OSC A, OSC B, NOISE/EXT.
- GLIDE:** RATE, AUTO, NORMAL.
- FILTER:** CUTOFF, RESONANCE, ENVELOPE AMOUNT, KEYBOARD AMOUNT.
- AMPLIFIER:** ATTACK, DECAY, SUSTAIN, RELEASE, MASTER TUNE, VOLUME.
- SEQUENCER:** SEQ 1 (RECORD, OFF), SEQ 2 (PLAY, OFF).
- ARPEGGIATE:** UP, UP/DOWN, OFF.
- MODE:** RETRIG, REPEAT/EXT, DRONE, GATE, NORMAL, NORMAL, OFF.

# Repeat

The control panel for the Repeat mode includes the following sections:

- MODULATION:** FROM (WHEEL, DIR, OSC A FREQ, AMOUNT, FIL ENV, ROUTE), TO (WH, OFF, DIR, OSC A FREQ, OSC A PW, DIR, OSC B FREQ, OSC B, WH, OFF, DIR, OSC B PW, LFO, DIR, FILTER).
- OSCILLATOR A:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, SYNC.
- OSCILLATOR B:** FREQUENCY, OCTAVE, -SHAPE-, PULSE WIDTH, LO FREQ, KYBD, NORMAL, OFF.
- MIXER:** OSC A, OSC B, NOISE/EXT.
- GLIDE:** RATE, AUTO, NORMAL.
- FILTER:** CUTOFF, RESONANCE, ENVELOPE AMOUNT, KEYBOARD AMOUNT.
- AMPLIFIER:** ATTACK, DECAY, SUSTAIN, RELEASE, MASTER TUNE, VOLUME.
- SEQUENCER:** SEQ 1 (RECORD, OFF), SEQ 2 (PLAY, OFF).
- ARPEGGIATE:** UP, UP/DOWN, OFF.
- MODE:** RETRIG, REPEAT/EXT, DRONE, GATE, NORMAL, NORMAL, OFF.

# Panel Blanks

These panel blanks are provided for you to record your own patches. Feel free to reproduce them for your own use.

This block contains the first of three identical control panel templates. Each template is organized into several functional sections:

- MODULATION:** Features a 'FROM' section with three rotary knobs for 'FIL ENV', 'OSC A PW', and 'OSC B PW', and a 'TO' section with three rotary knobs for 'OSC A FREQ', 'OSC B FREQ', and 'LFO'. Each knob has a 'WHEEL' and 'DIRECT' position.
- OSCILLATOR A:** Includes a 'FREQUENCY' knob, an 'OCTAVE' knob, a 'SHAPE' selector, and a 'PULSE WIDTH' knob.
- OSCILLATOR B:** Includes a 'FREQUENCY' knob, an 'OCTAVE' knob, a 'SHAPE' selector, and a 'PULSE WIDTH' knob.
- MIXER:** Features three rotary knobs for 'OSC A', 'OSC B', and 'NOISE/EXT'.
- GLIDE:** Includes a 'RATE' knob and a 'NORMAL' selector.
- MODE:** Features three selectors for 'RETRIG', 'REPEAT/EXT', and 'DRONE', and a 'GATE' selector.
- FILTER:** Includes four rotary knobs for 'CUTOFF', 'RESONANCE', 'ENVELOPE AMOUNT', and 'KEYBOARD AMOUNT'.
- AMPLIFIER:** Includes four rotary knobs for 'ATTACK', 'DECAY', 'SUSTAIN', and 'RELEASE'.
- LFO/CLOCK:** Includes a 'FREQUENCY' knob and a 'SHAPE' selector.
- SEQUENCER:** Includes two selectors for 'SEQ 1' and 'SEQ 2', and 'RECORD' and 'PLAY' buttons.
- ARPEGGIATE:** Includes an 'UP/DOWN' selector.

This block contains the second of three identical control panel templates, identical in layout and components to the first one.

This block contains the third of three identical control panel templates, identical in layout and components to the first one.