CIRCUIT
MONO STATION

user guide

novation

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CONTENTS

INTRODUCTION

Thank you for purchasing this Novation Circuit Mono Station, the next-generation sequenced monosynth. Circuit Mono Station is a powerful, but extremely compact electronic musical instrument combining two established Novation products: the original Circuit groovebox and the Bass Station II analogue synth. Circuit Mono Station gives you classic analogue synth sounds, two interacting step sequencers plus a modulation sequencer and full automation of almost all synth functions.

Circuit Mono Station has been designed to let you create music fast: you can create riffs, patterns and longer sequences quickly and easily, with the fat and expansive sounds that only true analogue sound generation can provide. It's both a compositional tool and a live performance instrument. You don't need to connect Circuit Mono Station to a computer or other device to make music – it's completely standalone. If you're working in the studio, Novation's superior sound quality means you can use Circuit Mono Station as the basis of your finished track.

The playing grid is a set of 32 illuminated, velocity-sensitive rubber pads, which act as synth keys, sequencer steps and have numerous other functions. The pads' internal illumination is intelligently RGB colour-coded*, so you can see at a glance what's going on. You can assemble patterns together into longer chains, and save your work in one of 32 session memories.

The synth section is reassuringly analogue: the controls - mostly a conventional and familiar set of single-function rotaries and switches, are always available to tweak your sounds. A large Filter control is positioned for easy access. There is a host of other quickly-accessible features: a choice of musical scales, adjustable tempo, swing and velocity, a flexible mod matrix and a unique mixer section featuring internally-illuminated, colour-coded controls.

Circuit Mono Station also sends and receives standard MIDI data, so you can connect other MIDI-compatible devices, synchronise with other drum machines or grooveboxes, or trigger synths, for example. The USB connection also handles MIDI; this lets you connect Circuit Mono Station to your computer so you can synchronise and record MIDI data to your DAW.

A Novation Circuit is the perfect accompaniment to Circuit Mono Station. Using the two units in tandem gives you a complete solution to electronic music making either in the studio or in live performance.

For additional information, up to date support articles and a form to contact our Technical Support Team please visit the Novation Answerbase at:
www.novationmusic.com/answerbase

* RGB LED illumination means that each pad has internal red, blue and green LEDs, each of which can light at different intensities. By combining the three colours at different brightness levels, almost any colour of illumination can be achieved.

Key Features

- Combines Bass Station II analogue synth with Circuit step sequencer
- 32-button multi-colour grid for playing and displaying information
- Split grid displays sequence steps and notes simultaneously
- 3-track sequencer: two oscillators plus modulation
- Velocity-sensitive pads
- Paraphonic operation allows the two oscillators to be independently sequenced
- 64 synth Patch memories, pre-loaded with factory sounds
- Tempo range from 40 to 240 BPM, plus tap-tempo mode
- 16 musical scales
- Adjustable Swing
- Patterns can be chained together
- Pattern Settings allow definition of rate, length and direction
- Two analogue oscillators with independent control of parameters
- Sub oscillator, noise generator and ring modulator
- Traditional multi-mode analogue filter section, with pre-filter overdrive control
- Analogue distortion with three modes
- Built-in mixer
- Selectable LFO sync rates including triplets
- 4 x 8 modulation matrix with Mod Depth control
- Clear and Duplicate functions
- Adjustable Note Velocity and Gate (Length)
- Line output (¼" jack)
- Separate headphone output
- USB port for MIDI data and firmware update
- MIDI In, Out and Thru
- CV and Gate outputs
- Assignable auxiliary CV Output
- External Audio Input
- External AC adaptor supplied
- Compatible with Novation Components: back up your sessions and patches on-line

About This Manual

We've tried to make this User Guide as helpful as possible for all types of user, both newcomers to electronic music making and those with more experience, and this inevitably means some users will want to skip over certain parts of it, while relative novices will want to avoid certain parts of it until they're confident they've mastered the basics.

Circuit Mono Station combines the technologies of two other Novation products – the Circuit groovebox and the Bass Station II analogue synthesiser. For clarity, we have tried to keep the descriptions of the sequencer and synthesiser parts of the unit separate, so after the Introduction and Getting Started chapters, you'll next find a more detailed description of how to use the sequencer aspects of Circuit Mono Station. As with other Novation synth User Guides, we've then included a "Synthesis Tutorial" (see page 59) which explains the principles of sound generation and treatment that are the foundation of all synthesisers. We think this will be of help and interest to all users. Following this, we go into the synth section in full detail. We hope this arrangement works for you.

There are a few general points that are useful to know about before you continue reading the User Guide. We've adopted some graphical conventions within the text, which we hope all types of user will find helpful in navigating through the information to find what they need to know quickly:

Abbreviations, conventions, etc.

Where top panel controls or rear panel connectors are referred to, we've used a number thus: 6 to cross-reference to the top panel diagram, and thus: (1) to cross-reference to the rear and side panel diagrams. (See "Top View – controls" on page 13 and "Rear View – connectors" on page 18).

We've used **Bold text** to name physical things – the top panel controls and rear panel connectors, and ***smaller Bold italics*** to name the various Views that the grid can display.

Tips

These do what it says on the tin: we include bits of advice, relevant to the topic being discussed that should simplify setting up Circuit Mono Station to do what you want. It's not mandatory that you follow them, but generally they should make life easier.

Extra Info

These are additions to the text that will be of interest to the more advanced user and can generally be avoided by the novice. They are intended to provide a clarification or explanation of a particular area of operation.

What's In The Box

Circuit Mono Station has been carefully packed in the factory and the packaging was designed to withstand rough handling. Should the unit appear to have been damaged in transit, do not discard any of the packing material and notify your music dealer.

If practical, save the packing materials for future use in case you ever need to ship the unit again.

Please check the list below against the contents of the packaging. If any items are missing or damaged, contact the Novation dealer or distributor where you purchased the unit.

- Novation Circuit Mono Station sequenced monosynth
- USB Type A to Type B cable (1.5 m)
- 3 x MIDI break-out cables: 3.5 mm 3-pole jack plug to 5-pin DIN socket
- Getting Started Guide, including Product/software Registration details
- Safety information sheet
- AC adaptor: 12 V DC, 1.25 A; includes interchangeable AC plug adaptors

Registering your Circuit Mono Station

It is important to register your Circuit Mono Station on-line using the Product/software Registration details at Step 4 of the Getting Started Guide. Apart from validating your manufacturer's warranty, you will also then be able to download the additional software that you are entitled to as a Circuit Mono Station purchaser:

- Ableton Live Lite music making software
- 1 GB of Loopmasters sounds and samples

The registration details also contain codes you will need to enter in the online forms on our website to download the software, but before you attempt to do this, warranty registration is required.

Power Requirements

Circuit Mono Station should be powered from AC mains via the AC adaptor supplied. It cannot be powered from a computer or other device via a USB connection.

The AC adaptor supplied with the unit is a 12 V DC, 1.25 A type, and can operate on mains voltages from 100 V to 240 V, 50 or 60 Hz. The adaptor has interchangeable slide-in AC plug heads; two alternative plug heads are supplied which make the adaptor compatible with AC outlets in many different countries. Plug heads can be easily swapped if necessary by pressing the spring-loaded semi-circular button in the centre of the adaptor and sliding the plug head upwards to separate it from the adaptor body. Then slide in the correct plug head (as shown by the arrows), ensuring that it locks firmly in place.

The cable from the AC adaptor connects to the coaxial DC input socket on the rear panel of Circuit Mono Station ((9) on "Rear View – connectors" on page 18).

The use of AC adaptors of a type other than that supplied is not recommended. Please contact your Novation dealer for advice on alternative PSUs if necessary.

Glossary

Some of the terms used in this manual have a specific meaning as applied to Circuit Mono Station. Here is a short list:

Term	Button	Definition
Cursor		When the sequencer is running, the “current” note is indicated by one pad illuminated white: this Step, the current position in the pattern, is referred to as the cursor.
Dual View	**Osc 1 + Osc 2**	Splits the playing grid so that you can access both Oscillators simultaneously.
Expand View	**Shift + Note**	Doubles the number of performance pads from 16 to 32, increasing the pitch range from two to four octaves.
Fixed	**Shift + Velocity**	Allows the velocity response of the grid pads to be disabled.
Gate View	**Gate**	The Gate value of a note is how many steps it sounds for. Gate View allows the length of a step to be edited.
Glide View	**Shift + Gate**	A Glide time may be associated with the notes at each Step: consecutive notes will glide in pitch between each other, as defined by the Glide time.
Global View		A View that allows editing of a whole Session.
Grid pad		One of the 32 pads making up the main performance area.
Init Session		The “empty” Session that will be loaded on power-up if you hold down **Shift + Clear** while pressing the **Power** button.
Key Tracking	**Shift + Osc 1**	A View that allows you to link the Filter frequency to the pitch of the note.
Live Record	**Record**	Lets you add synth notes in real time while a pattern is playing. Also records any movements of the synth knobs and sliders.
Manual Step Entry		Assignment of synth notes to specific step in a pattern. With a step pad pressed, press the performance pad for the note to be added. Can be done with the sequencer either running or stopped.
Modulation Sequence	**Mod Seq**	A virtual Track: instead of note data, it carries per-step control parameter data which is available to the Modulation Matrix as a source.
Mutate	**Mutate**	A single press of Mutate will randomly re-sequence the Notes making up a Pattern. Per-Note properties such as Gate and Glide are retained.

Term	Button	Definition
Note View	**Note**	The View that is used to assign synth notes to pattern steps.
Paraphonic Mode 1	**Shift + Scales**	Normal mode (default): Only Osc 1 triggers the VCA.
Paraphonic Mode 2		Both Osc 1 and Osc 2 trigger the VCA.
Patch		A specific synth “sound”: defined by a set of values for all synth parameters. There are 64 Patch memories, pre-loaded with factory Patches.
Patch View	**Patches**	A Global View which allows synth Patches to be loaded or saved.
Pattern		A repeating cycle of synth notes of up to 16 steps, associated with one of the three Tracks. Includes data for velocity, gate, length and automation.
Pattern Chain		A cyclic set of Patterns played continuously one after the other.
Pattern Edit View		A View that allows editing of a Pattern. The Pattern's steps are always visible in these views. Note, Velocity, Gate, Glide and Pattern Settings View are all Pattern Edit Views.
Pattern memory		Where a Pattern is stored.
Pattern Settings View	**Pattern Settings**	A Pattern Edit View that allows the user to edit the length of a pattern for any Track, set the playback direction and sync rate.
Patterns View	**Patterns**	A Global View which allows Patterns to be loaded or saved.
Performance Pad		The grid pads used to enter synth notes in Note View or Expand View.
Playback Cursor		In playback, the white pad which moves through the pattern display, indicating which step is currently being played. Changes to red in Record Mode.
Playback Mode		Circuit’s operating mode with the sequencer running; the **Play** button will be lit bright green.
Record Mode		An operating mode allowing synth notes to be added to the Pattern. The **Record** button will be lit bright red.
Scale View	**Scales**	Allows the user to select one of 16 musical scales. Also allows transposition of the keyboard.
Session		A set of all necessary data for full playback of all tracks, including Patches, Patterns, Chains, automation data, etc. Up to 32 Sessions can be saved in flash memory.
Sessions View	**Sessions**	The View used to save and load Sessions.

Term	Button	Definition
Setup Page	**Shift + Power**	Allows control of MIDI clock and TX / RX settings. Normal operation is suspended while the Setup Page is open.
Smooth	**Shift + Mod Seq**	Applies to the Modulation Sequence: interpolates between successive assigned values to produce a gradual transition.
Step		By default, each Pattern is subdivided into 16 Steps: the number of steps may be adjusted in Pattern Settings View.
Step buttons		Collective name for the button group comprising the **Note**, **Velocity**, and **Gate** buttons.
Stop Mode		Circuit's operating mode when the sequencer is not running.
Swing	**Shift + Tempo**	Adds a subtle variation to the tempo: alternate notes are shifted in time.
Swing Sync	**Shift + Tap**	Sets a range parameter for the Swing control.
Synth Controls		The upper section of the top panel: a set of controls for the standard sections of an analogue synth, such as Oscillator, Filter, Envelope, etc.
Tracks		Three Tracks are supported – Oscillator 1, Oscillator 2 and the Modulation Sequence.
Velocity View	**Velocity**	Allows editing of the velocity of a step.
View		One of various ways the 32 grid pads can be used to display information and allow user interaction.

HARDWARE OVERVIEW

Top View – controls

Master controls:

1 **Volume** – controls the overall level at the audio outputs.

2 **Tempo** – lets you set the BPM (tempo) of the sequence. Hold down **Shift** to re-assign it as a **Swing** control, which will alter the timing between steps to change the 'feel' of a pattern.

3 **Tap** – lets you set the tempo "manually", by tapping the button. Hold **Shift** and press **Tap** to open ***Swing Sync View***.

Grid controls:

4 32-pad playing grid – a 4 x 8 matrix of rubber pads; internally illuminated with RGB LEDs. Many Views 'split' the grid horizontally into two 2 x 8 matrixes, but some divide it into logical areas with different functions.

Most of the remaining buttons switch the 32-pad grid into a specific ***View***. Each View provides information about and control of a particular aspect of the Track, Pattern, timing, etc.

Most buttons have both a momentary (long press) and a latching (short press) mode. A long press will temporarily display that button's View, but only while the button is held down. When released the View will revert to whatever it was before the button was pressed. A short press on a button will switch the View to that programmed into the button.

Additionally, many of the buttons have a second "Shift" function: in all cases, the name of the shifted function is silkscreened on the top panel immediately above the button.

5 Track buttons: **Osc 1**/**Osc 2**/**Mod Seq** – three buttons selecting which of the three Tracks will have their attributes displayed. **Osc 1** and **Osc 2** may be pressed simultaneously to enter ***Dual View***, which allows the notes for both oscillators to be played from the same View.

6 STEP buttons: **Note**, **Velocity** & **Gate** – these switch the grid to ***Note***, ***Velocity*** and ***Gate*** View respectively, and allow the parameters of each step of the pattern to be individually entered, deleted or modified.

7 **Pattern Settings**: selects a View that allows adjustment of pattern length and sync rate, play direction and start and end points.

8 **Scales** – this button allows the selection of one of sixteen different music scales for the synth keyboard, and also lets you transpose the synth keyboard to a higher or lower key.

9 **Patterns** – opens a View where you can store multiple Patterns for each Track: sixteen for Oscillator 1 and eight each for Oscillator 2 and the Modulation Sequence. You can then join them together to make a Pattern Chain.

10 **Patches** – this View is where you store your Synth Patches. There are 64 Patch memories, all of which come pre-loaded with factory sounds. Use the **Oct** ▼ and **Oct** ▲ buttons to select two pages (each of 32 Patches).

11 ▶ Play and ● Record– these two buttons start and stop the sequence (Play) and enter Record mode (Record). In Play mode anything you play on the grid will be heard; in Record mode, anything you play will be heard and also added to the sequence.

12 **Oct** ▼ and **Oct** ▲ – these let you shift the playing pads' pitch up by one to five octaves or down by one to six octaves. The pitch range of each of the two oscillators is adjustable independently. Press both buttons together to restore the pads' pitch to normal (i.e., based on middle C).

13 **Clear** – allows deletion of individual Pattern Steps, Patches, Patterns, Sessions or automation data.

14 **Save** and **Sessions** – let you save your current Session, or open a previously-saved one. You can also use **Save** to store Patches independently from Sessions.

15 **Shift** – several of the buttons (and two of the rotary controls) have a "second function", which is accessed by holding down the Shift button while pressing the button or knob in question:

Button/knob		Shifted action	Shifted function
8	**Scales**	**Paraphonic mode**	Switches between Paraphonic Modes 1 and 2
6	**Note**	**Expand**	Opens ***Expand View***; doubles the size of the playing area
	Velocity	**Fixed**	Assigns a fixed velocity value to each note in a Pattern
	Gate	**Glide**	Opens ***Glide View***: allows a glide value to be assigned to each Step
7	**Pattern Settings**	**Mutate**	Randomizes the Steps in the current Pattern
13	**Clear**	**Duplicate**	Operates like a copy-and-paste function for Patterns or Steps.
5	**Osc 1**	**Key Tracking**	Causes the filter frequency to track the pitch of the note being played
	Osc 2	**Osc Sync**	Allows Osc 1's waveform to retrigger Osc 2's
	Mod Seq	**Smooth**	Modifies the action of the Modulation Sequence Track
2	**Tempo**	**Swing**	Time-shifts alternate notes in the Pattern
3	**Tap**	**Swing Sync**	Applies a range parameter to Swing
19	**Fine**	**Pulse Width**	Alters waveform duty cycle for Pulse waveforms
12	**Oct ▼, Oct ▲**	**Pattern Octave**	Allows the octave of a Pattern to be shifted after recording
27	**Audio In**	**Audio In Gain**	Adjusts the gain of the external audio input
10	**Patches***	**Init Patch**	Loads Init Patch: resets all synth parameters to a default state
	Pattern *(within Pattern View)*	**Instant Pattern Switching**	A new Pattern will begin playing immediately instead of waiting for the current Pattern to finish.

* available on software versions 1.1 or later.

Synth controls:

Apart from the **MASTER** section, the upper half of Circuit Mono Station's control surface has the controls for the mono synth engine.

OSCILLATORS section:

16 **Range** – steps through the base pitch ranges of the oscillator selected by **Osc 1** or **Osc 2** 5 in octaves. For standard concert pitch (A3 = 440 Hz), set to **8**'.

17 **Waveform** – steps through the range of available oscillator waveforms – sine, triangular, sawtooth and pulse.

18 **Coarse** – adjusts the pitch of the selected oscillator over a range of ±1 octave.

19 **Fine** – adjusts the oscillator pitch over a range of ±100 cents (±1 semitone).

LFO section:

20 **Rate** – adjusts the frequency of the LFO.

21 **Wave** – this button steps through the available LFO waveforms: triangle, sawtooth, square, sample and hold. The associated LED gives a visual indication of the LFO speed and waveform.

22 **Sync** – press to synchronise the LFO rate to the current tempo clock (internal or external). 35 different sync rate divisions are available: use the Rate control 20 to select one.

MIXER section:

23 **Osc 1** – controls level of Oscillator 1's waveform.

24 **Osc 2** – controls level of Oscillator 2's waveform.

25 **Sub** – controls level of the Sub Oscillator signal.

26 **Noise** – controls the level of white noise added to the sound.

27 **Audio In** – level control of the signal applied at the rear panel AUDIO IN connector (2).

28 **Ring 1*2** – sets the output level of the Ring Modulator circuit: the inputs to the Ring Modulator are Osc 1 and Osc 2.

ENVELOPE section:

29 A set of four faders adjusting the usual ADSR Envelope parameters (**Attack**, **Decay**, **Sustain** and **Release**).

FILTER section:

30 **Shape** – this button steps through three filter characteristics: low-pass (**LP**), band-pass (**BP**) or high-pass (**HP**).

31 **Slope** – toggles between two filter slopes: sets the slope of filter outside the passband to **12dB** or **24dB** per octave.

32 **Frequency** – large rotary knob controlling the filter's cut-off frequency (LP or HP), or its centre frequency (BP).

33 **Resonance** – adds resonance (an increased response at the filter frequency) to the filter characteristic.

34 **Overdrive** – adds a degree of pre-filter distortion to the mixer output.

35 **Bypass** – By default, the filter affects all components of the synth's sound, but its effect on the Osc 2 and Noise signals may be overridden with the Bypass button, which steps through the two sources both individually and together.

DISTORTION section:

36 **Type** – distortion is applied after the filter section. This button steps through three distortion types (**I**, **II** and **III**). Type **I** produces the distortion used in Bass Station II, Type **II** is a fuzz type distortion. Type **III** is a combination of the two.

37 **Level** –adjusts the amount of distortion.

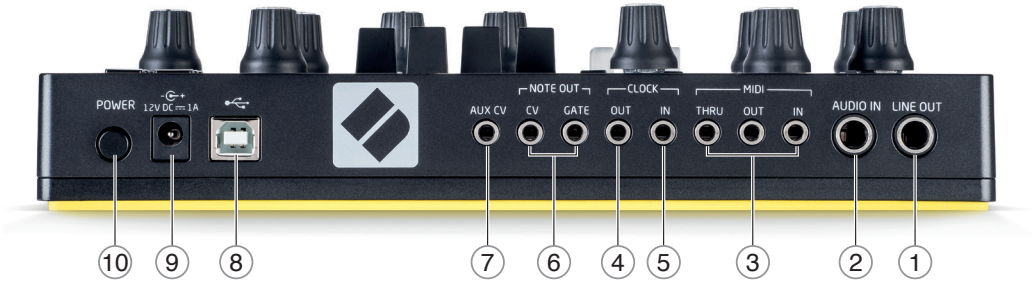
MODULATION MATRIX:

38 **Source** – this button steps through the four modulation sources available to the matrix: the Envelope generator (**Env**), the LFO (**LFO**), the Modulation Sequencer (**Seq**) and velocity (**Vel**).

39 **Destination** – six buttons selecting the eight modulation destinations: **Pitch** and **PWM** (Pulse Width Modulation) refer to the two main oscillators, the colour of the internal LED indicating which oscillator is currently selected by the Track buttons 5. Other destinations are VCA Level (**Amp**), Filter frequency (**Filter**), distortion amount (**Dist**) and the level of the Aux CV output (**Aux CV**).

40 **Depth** – adjusts the degree of modulation applied to the selected destination by the selected source. Note that matrix settings are additive: you can apply any combination of sources to any combination of destinations, with different **Depth** settings.

Rear View – connectors



① **LINE OUT** – the main (mono) audio output on a ¼" TRS jack socket. Max. output level is +10.5 dBu. The output is pseudo-balanced (ground compensated) and may be connected to equipment with either balanced or unbalanced inputs.

② **AUDIO IN** – a line level input allowing an external audio signal to be added to Circuit Mono Station's output (via Mixer level control 27).

③ **MIDI IN**, **OUT** and **THRU** – MIDI connectors on three 3.5 mm TRS jack sockets. Use the break-out cables supplied to convert these to the industry-standard 5-pin DIN sockets.

④ **CLOCK OUT** – a 3.5 mm TRS jack socket supplying a clock signal of 5 V amplitude, at a rate proportional to the tempo clock: the actual ratio can be set in ***Settings View***. The default rate is one pulse per quarter note.

⑤ **CLOCK IN** – a 3.5 mm TRS jack socket for an external clock source. Each pulse applied advances the sequence by a quarter note. Voltage range: -0.5 V to +5.5 V. Logic 'low': <1 V, Logic 'High': >2.3 V.

⑥ **NOTE OUT** – two 3.5 mm TRS jack sockets carrying Control Voltage (**CV**) and **GATE** signals derived from Osc 1's sequence for driving compatible external equipment. The **CV** output is scaled at 1 V per octave and the **GATE** output 5 V amplitude.

⑦ **AUX CV** – a secondary CV output (+5 V to -5 V on a 3.5 mm TRS jack socket) whose source may be assigned in the Modulation Matrix.

⑧ ⇢ – Type B USB 2.0 port. A Type B-to-Type A cable is supplied with the unit. The port is MIDI class compliant; connect to computers and other devices supporting MIDI via USB to transmit and receive MIDI data. Also used for firmware updates. Note – Circuit Mono Station's USB port does not carry either DC power or audio.

⑨ -⊙+ – power input socket. Circuit Mono Station requires 12 V DC at 1 A. Connect the AC adaptor supplied to this coaxial socket.

⑩ **POWER** – "soft" on/off switch; to prevent inadvertent power up/down, a press of approx. half a second is needed to turn the unit on or off.

Front and side views

⑪ 🎧 (Headphones) – connect a pair of stereo headphones to this 3.5 mm TRS jack socket. The headphone amplifier can drive +10.5 dBu into 150 ohms.

⑫ Kensington security slot – secure your Circuit Mono Station to a suitable structure if desired. Please see http://www.kensington.com/kensington/us/us/s/1704/kensington-security-slot.aspx for further information on how to use this feature.

BASICS

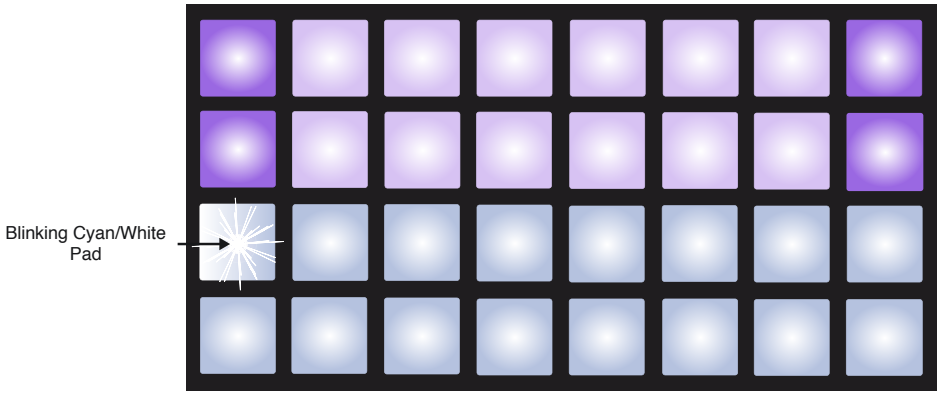
Powering the unit on

Circuit Mono Station must be powered from the supplied AC adaptor. Connect the adaptor to the DC input socket (10) and plug the adaptor into the AC mains.

Connect the main output to a monitoring system (powered speaker or a separate amplifier and passive monitor) or, if your prefer, plug in a pair of headphones at the front of the unit.

Long-press the Power button (10) to turn Circuit Mono Station on: this will re-load the Session that was in use last time the unit was on. The first time you power the unit “out of the box”, this will be Session 1, which is the first of the 16 demo Sessions that were loaded at the factory (see “Getting started” on page 21).

Circuit Mono Station always starts up in ***Note View***, with Osc 1 selected as the displayed Track. The grid display will look something like this:



You can override the automatic re-loading of the previous Session at power-up by holding down the **Shift** and **Clear** buttons while pressing the Power button*. This will load the Init Patch instead.

* on software versions 1.1 or later

Getting started

We've pre-loaded 16 demo Sessions into the Session memories to give you an idea of how Circuit Mono Station works. Press the Play button 11; you should hear the first demo Session.

If it's not already lit, press the **Osc 1** button 5; Circuit Mono Station is now displaying ***Note View*** for Oscillator 1. The two upper rows – the synth pads - show the notes that Osc 1 is contributing to the sequence, while the two lower rows – the sequencer steps - show the progression through the Pattern. You can see the contributions made by Osc 2 by pressing the **Osc 2** button. Note that the notes of Osc 1 are coded purple and those of Osc 2 green; when the Pattern includes a synth note, the pad corresponding to the note changes to white. Similarly, the sequencer pads are pale blue, but turn white as the "play cursor" moves through the sequence. Note that the demo Sessions are Pattern Chains – several 16-step Patterns sequenced together. You can change the tempo with the Tempo control 2.

If you press the **Mod Seq** button, the ***Modulation Sequencer View*** opens, and you will be able to see how this "virtual" track has been programmed to produce the sonic effects you are hearing.

Press the Play button to stop.

You can listen to other demo Sessions by pressing **Sessions** 14 and selecting any other pad on the upper two rows of the grid (each pad in ***Sessions View*** represents a Sessions Memory location).

The demo Sessions

We recommend that you work through the factory demo Sessions, which have been designed specifically to illustrate the various features available in Circuit Mono Station for sound and Pattern creation. Select different Sessions and spend some time listening to them: we are sure you will be both impressed by the range of sonic possibilities and curious as to how Circuit Mono Station was programmed to create them.

First, while playing a Session, select ***Patterns View*** (press **Patterns** 9) to see how multiple Patterns are chained together for each Track. You can select individual Patterns and listen to them in isolation, and also turn down the level controls in the Mixer Section to get an idea of what each Track (and other sources) is contributing to the overall sound. Use the **Osc 1**, **Osc 2** and **Mod Seq** buttons as described above to see the contributions of individual Tracks.

Note that auditioning just one Pattern of a Pattern Chain effectively cancels the selection of its "parent" Session, but you can reselect the Session by returning to Sessions View and pressing its pad again.

By pressing **Velocity**, **Gate** 6, **Scales** 8 or **Pattern Settings** 7, you can see further Views which will allow you to see how each of these settings has been programmed or configured to create what you are hearing. You can also see which Patch was used as the basis for the Session by pressing **Patches** 10.

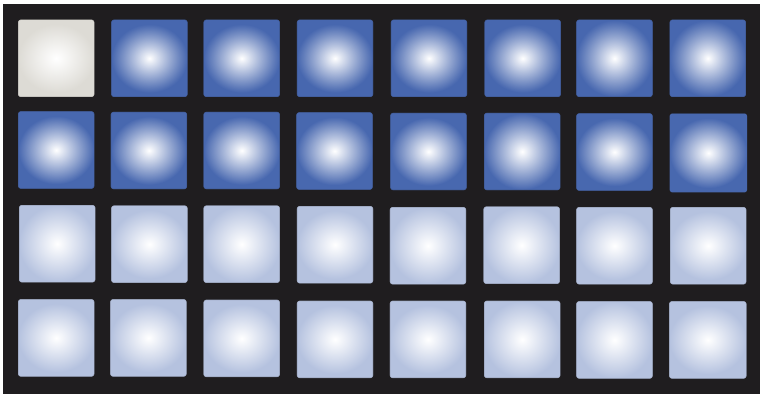
You should also observe the LEDs associated with the various synth controls: with most of the demo Sessions, you will see these changing in brightness as the Session plays, indicating that the controls were adjusted in real time as the Patterns were programmed. This is Circuit Mono Station's Automation at work - a very powerful feature.

Later in the manual, we explain in detail how each of these Pattern and synth features can be programmed or configured.

Loading and Saving Sessions

When you power Circuit Mono Station on, the Session played will be the last one used when it was powered off. The first time you power it on out of the box, it will play Session 1, which will contain one of the demos described above.

To load a different Session, you use ***Sessions View***. Press **Sessions** 14 to open this:



Each pad corresponds to one of the memory slots. The pad's colour indicates the slot's status:

- Dim blue – slot is empty
- Bright blue – slot contains either a Session saved by the user or a factory demo Session. (Note that bright blue is the default – you can change the colour to help identify saved sessions – see the following page.)
- White – the currently selected Session (only one pad will be white)

If you're still experimenting, you can select a different factory demo to listen to and play around with. You can jump between saved Sessions while in Play mode.

Sessions loaded when the sequencer is not running will play at the tempo that was in force when the Session was saved.
Sessions loaded while the sequencer is running will play at the tempo that is currently set. This means that you can recall different Sessions sequentially with the confidence that the tempo will remain constant.

There's nothing special about the slots containing factory demo Sessions: you can overwrite these if you wish.

IMPORTANT – ENABLING SAVE
By now you will probably have read the Getting Starting Guide shipped with your Circuit Mono Station, so will be aware that Session Saving is disabled, but in case you haven't, we're repeating it here:

The Save function is deliberately disabled before shipping from the factory to prevent accidental erasure of the demo Sessions. The **Save** button 14 will initially be unlit, and before you can save any Sessions of your own, you will need to unlock the **Save** function. To do this, hold down the **Shift** 15 and **Save** buttons together while powering Circuit Mono Station on. **Save** will now be illuminated blue.

You can choose to disable Save in the same way – hold down **Shift** and **Save** while powering Circuit Mono Station on, and the **Save** button will no longer be illuminated, indicating that the Save function is now disabled.

Note also that the Clear Session function is also disabled when Save is disabled.

You don't need to be in ***Sessions View*** to save a Session you've been working on. If you press **Save** 14, the button flashes white; if you press it a second time, it blinks green rapidly for a second or so to confirm the save process. However, in this case, your work will be saved in the last selected Session memory, which will most likely be the one that held an earlier version; the earlier version will be overwritten.

To save your work in a different Session memory (leaving the original version unchanged), enter ***Sessions View***. Press **Save**; both **Save** and the pad for the currently selected Session will flash white. Press a different memory pad: all the other pads will go dark, and the selected pad will blink green rapidly for a second or so to confirm the save process.

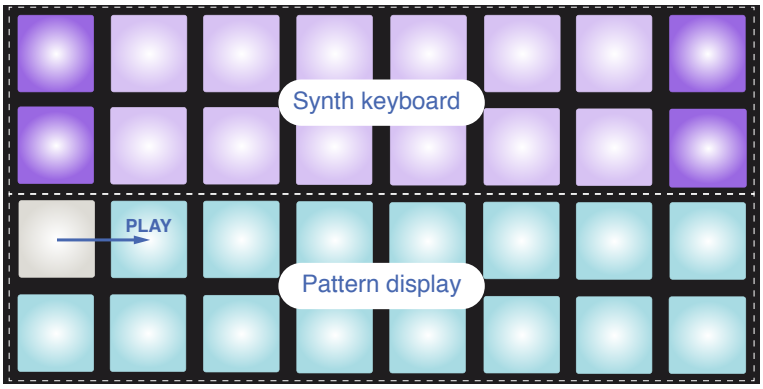
You can also assign a different colour to any of the pads in Session View – this can be a great help in live performance. You choose the colour as part of the Save procedure described above. After pressing **Save** for the first time, the **Oct** ▼ and **Oct** ▲ buttons 12 will light in the current colour of the pad for the currently selected Session: if you've not already changed the colour, they will be blue. You can now scroll through a palette of 14 colours by pressing the **Oct** ▼ and **Oct** ▲ buttons. When you see the colour you want, press Save for the second time to complete the Save process, with green flashes as described above. Note that because you always save to the currently selected Session memory, and the pad for that is always white, you won't immediately see the new colour, but you will do so as soon as you select a different Session.

Starting from Scratch

Once you've experimented with the factory demos for a while, you will probably want to create a Pattern from scratch.

Select **Sessions** and select an empty memory slot. Now select ***Note View*** and **Osc 1**. When you press Play you'll see the white pad (the play cursor) progressing across the 16 steps of the Pattern display. Now you can add synth notes. The upper two rows of the grid represent a music keyboard, the lower two show you where you are in the sequence. When Play is pressed, you can see the white pad progressing through the steps.

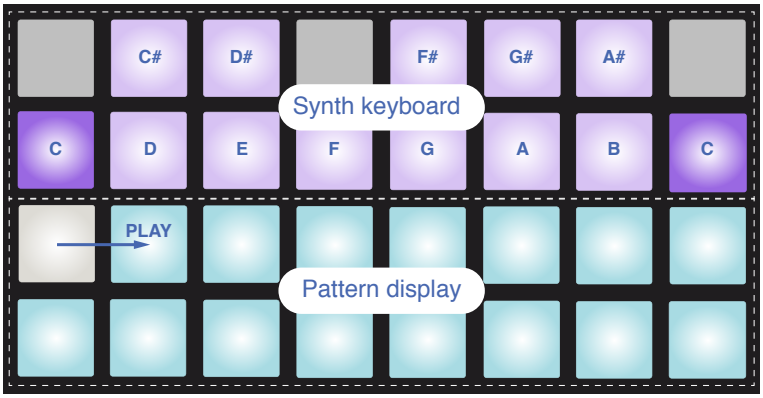
With all scales except Chromatic (see "Scales" on page 30), the grid display looks like this:



The "keyboard" is two octaves, with the purple pads representing the lowest and highest notes in each. You can add synth notes in real time by just playing them, or you can add them to the pattern by pressing Record 11. While the Record button is lit, anything you play will become part of the pattern.The synth sound you'll hear when you've selected an empty Session will always be Patch 1.

The **Oct** ▲ and **Oct** ▼ buttons alter the pitch range of the currently selected synth keyboard, by one octave each time they are pressed, up to a maximum of five octaves above or six octaves below the default octave. The lowest note in the default octave corresponds to 'middle C' on a standard piano keyboard (providing that different root note for the scale has not been defined – see "Root note" on page 32).

For a conventional piano keyboard, press and hold Scales [8] and then press Pad 32 (the bottom right one), which will turn red. This gives the keyboard Chromatic scaling, and the layout differs from that in the other scales:



Chromatic scaling offers all twelve notes in the octave; to accommodate them, the keyboard “size” is reduced to one octave.

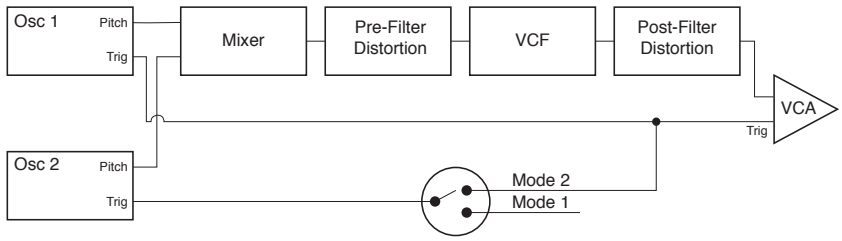
Synth section - basics

The two synth oscillators – Osc 1 and Osc 2 - have distinctive RGB colour coding for the pads, which is reflected in other Views and in LEDs elsewhere on the control panel, so you always know which oscillator is being adjusted. Osc 1 uses purple and Osc 2 uses green. On the playing pads, the high and low C notes in each octave show a different shade than the intermediate keys.

Paraphonic voicing

A fundamental feature of Circuit Mono Station's operation is its paraphonic voicing. This means that the two Oscillators share the synth's VCA, envelope generator and filter, and can play at different pitches, but can only be heard together when the envelope is "open".

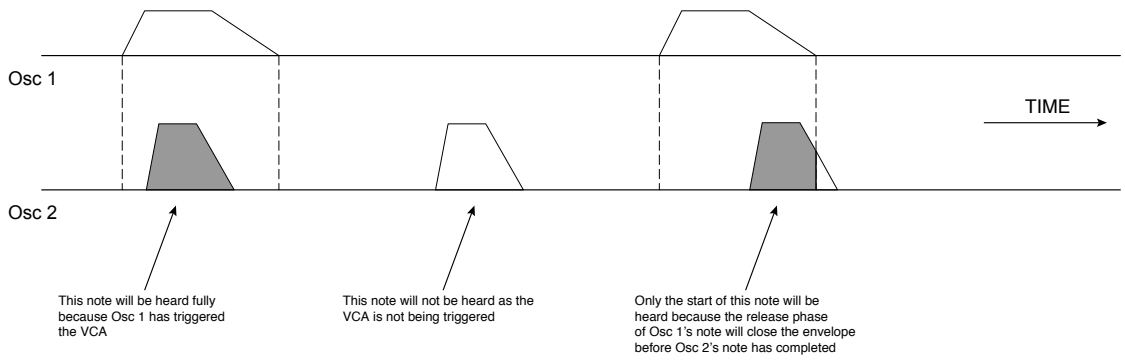
SIMPLIFIED BLOCK DIAGRAM
SHOWING PARAPHONIC MODE SWITCH.



PARAPHONIC MODE SWITCH

In normal (default) operation only Oscillator 1 triggers the VCA. We call this mode **Paraphonic Mode 1**, and it is the mode you will use when playing Circuit Mono Station in live performance or for recording. This mode is confirmed by the **Scales** button [8] being lit dimly white when **Shift** [15] is pressed. In Paraphonic Mode 1, every note played on the keys triggers both Oscillators, but the VCA is triggered only by Oscillator 1. The contribution that each oscillator makes to the overall sound can be heard provided the **Osc 1** and **Osc 2** level controls ([23] and [24]) are turned up in the Mixer Section, and the pitch and waveform of each oscillator can be adjusted independently.

The important point about Paraphonic Mode 1 is that because it is Oscillator 1 that triggers the VCA, Oscillator 2 will only be heard when a note in Oscillator 1's Pattern is of sufficient duration to trigger the VCA. This point is illustrated below:



PARAPHONIC MODE 1

When creating Patterns, it is obviously helpful to be able to hear each Oscillator's contribution while programming. For this reason, Circuit Mono Station has a secondary mode, **Paraphonic Mode 2**. This is selected by pressing **Shift** 15 and **Scales** 8 together: the Scales button will now illuminate *bright* white. In this mode, Oscillator 2 triggers the VCA as well as Oscillator 1, so you can turn the **Osc 1** Mixer level control down and hear all the notes in Oscillator 2's Pattern.

Tracks

Each of Circuit Mono Station's two Oscillators constitutes a Track. As described above, the notes recorded on each Oscillator Track will be interdependent to a degree.

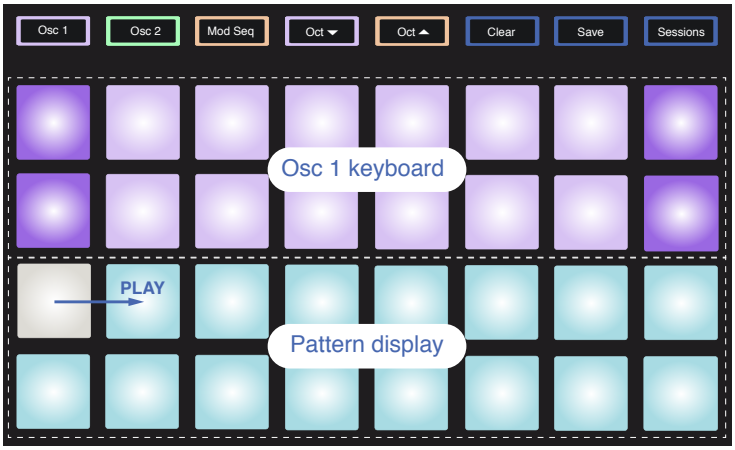
There is also a third "virtual" Track, the **Modulation Sequencer**. You can use this "data" Track to record a parameter value for every Step in the Pattern. This can then be selected in the synth's Modulation Matrix to control any of the matrix's controllable parameters, such as oscillator pitch, pulse width, filter frequency and so on. More details can be found at "The Modulation Sequencer" on page 44.

Programming the Modulation Sequencer Track (referred to elsewhere in this Guide as **Mod Seq**) is a very similar process to programming other per-Step attributes, such as Gate length, Velocity and Glide. A really powerful feature of Circuit Mono Station though, is that you can make the Mod Seq data available to other compatible equipment (e.g. Eurorack modules) with the **Aux CV** output. These topics are all covered in greater detail further on in this Guide.

Note View

To play a synth in real time, press the **Osc 1** Part button 5 and then **Note** 6. This places the grid in ***Note View*** for Osc 1. **Note** will illuminate purple. The upper two rows of the grid constitute the synth keyboard, while the two lower rows show steps the 16-note pattern. Note these are always illuminated pale blue, apart from the "current" step, which flashes white.

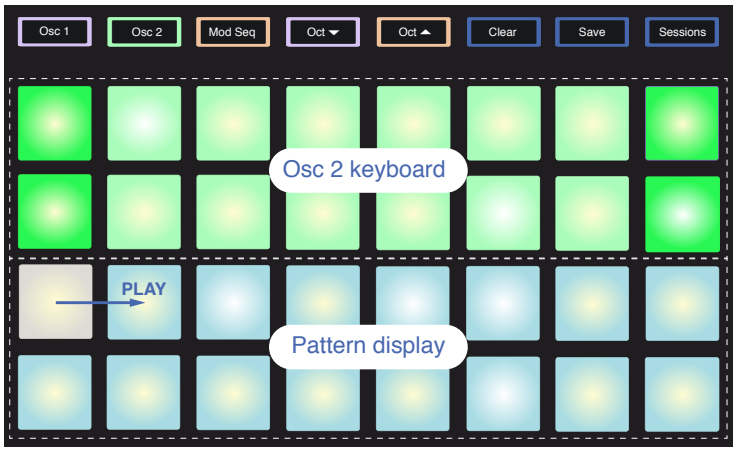
Osc 1 selected



In order to hear the notes from Oscillator 1, ensure that the **Osc 1** level control in the Mixer section 23 is turned up.

The corresponding ***Note View*** for Oscillator 2 can be obtained by pressing the **Osc 2** Part button [5]:

Osc 2 selected



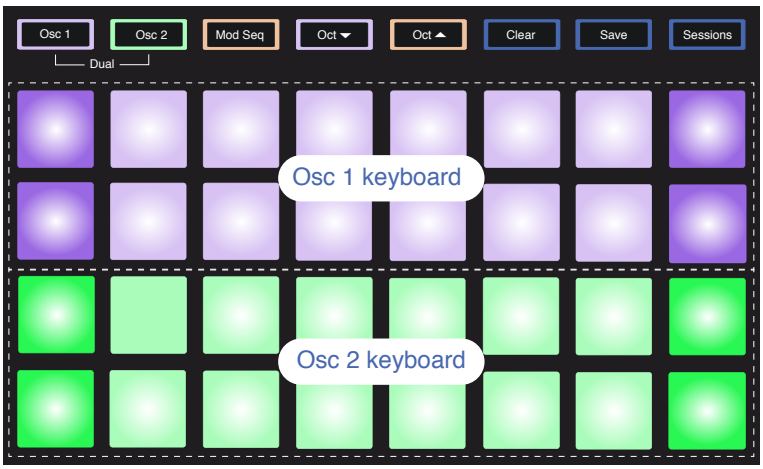
The Osc 2 level control in the Mixer section [24] must be turned up and Paraphonic mode 2 selected (by pressing **Shift** + **Scales**) in order for Oscillator 2's notes to be audible. Note that the **Scales** button is illuminated bright white when Mode 2 is active.

With the exception of the Chromatic scale (see Scales, page 30), the top row of playing pads contains notes one octave above those in the second row. The highest note of the lower octave (Pad 16) is the always the same as the lowest note of the upper octave (Pad 1). Thus to play the notes over two octaves in ascending order, start with Pads 9 to 16, then 1 to 8.

When Circuit Mono Station is powered up and an empty or new Session selected, Middle C will normally be the lowest note of the two octave keyboard (Pad 9). It is possible to alter the keyboard 'layout' so that the bottom note is something other than C – see page 30. The oscillators have a total range of 12 octaves; you can access higher or lower pairs of octaves by using the **Oct** ▼ and **Oct** ▲ buttons [12]. Note that at the highest and lowest octave settings, the 'size' of the keyboard is limited.

Dual View

If you press both **Osc 1** and **Osc 2** together, Circuit Mono Station enters ***Dual View***. This lets you access a two-octave keyboard for both Oscillators simultaneously, which is great for getting to grips with the unit's paraphonic potential in real time.



Pressing **Note** returns the grid to ***Note View***.

Expanded Note View

To obtain a keyboard with a wider range, hold down **Shift** 15 and press **Note** 6; **Note** now illuminates white. This View is ***Expanded Note View***, and removes the pattern display in the two lower rows of the grid, replacing it with keys for the next two lower octaves of the selected scale.

Osc 1 selected

Osc 2 selected

This View is very useful when recording synth notes in real time.

Expanded Note View can be cancelled by pressing **Note** again; the lower two rows of the grid now resume the pattern's step display.

Scales

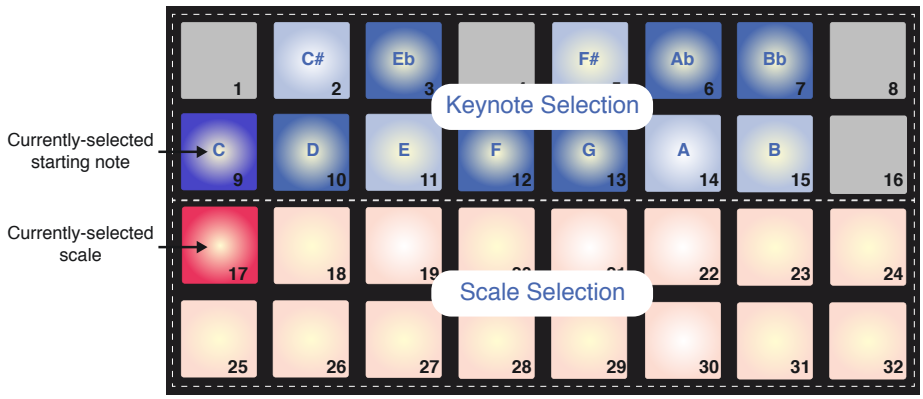
Circuit Mono Station is extremely flexible in how it lets you configure the note pads in the playing grid to suit many musical genres in key or scale. There are two aspects to specifying how the note pads are laid out: the scale and the root note.

Up to 16 musical scales are available: these include those common in western musical styles such as major, natural minor, pentatonic and chromatic as well as more unusual scales (or modes) such as Dorian, Lydian and Mixolydian. Not all these scales contain eight notes, though the only one that has more than eight is Chromatic, with 12.

> You don't need to understand musical theory to make use of different scales. Because Circuit Mono Station lets you alter the scale in use after you've created a pattern, it's easy to get an idea of their effect and their differences. Record a simple pattern of synth notes, and then play it back using different scales. You'll notice that with some scales certain notes shift up or down a semitone, and that this gives the "melody" you've composed quite distinct "moods" or "feels", some of which will be more suited to what you're trying to achieve than others.

Furthermore, although the default keyboard is based on a note of C (as described in the previous section), it is possible to redefine the lowest sounding note to be any note of the chosen scale.

Both scale and root note are set using the ***Scales View***, accessed by pressing the **Scales** button [8]. The ***Scales View*** will look similar to that shown below:



Scale selection

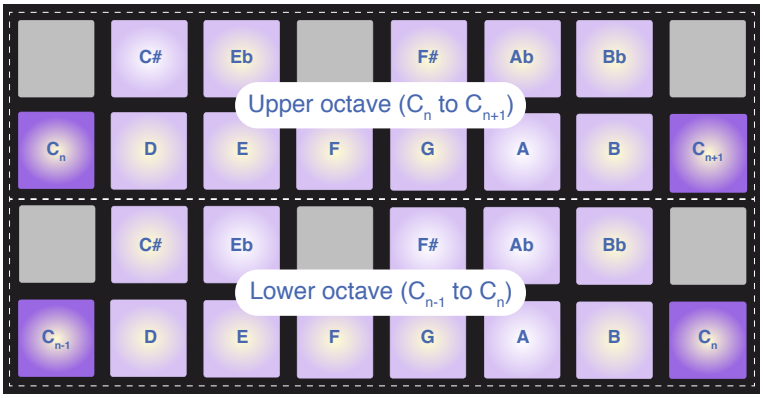
In **Scales View**, the bottom two rows allow selection of one of the 16 available musical scales. These are listed in the table below, with the notes that each scale includes when the lowest note in the scale is C:

Pad	Scale	C	C#	D	Eb	E	F	F#	G	Ab	A	Bb	B
17	Natural Minor	✓		✓	✓		✓		✓	✓		✓	
18	Major	✓		✓		✓	✓		✓		✓		✓
19	Dorian	✓		✓	✓		✓		✓		✓	✓	
20	Phrygian	✓	✓		✓		✓		✓	✓		✓	
21	Mixolydian	✓		✓		✓	✓		✓		✓	✓	
22	Melodic Minor (ascending)	✓		✓	✓		✓		✓		✓		✓
23	Harmonic Minor	✓		✓	✓		✓		✓	✓			✓
24	Bebop Dorian	✓			✓	✓	✓		✓		✓	✓	
25	Blues	✓			✓		✓	✓	✓			✓	
26	Minor Pentatonic	✓			✓		✓	✓	✓			✓	
27	Hungarian Minor	✓		✓	✓			✓	✓	✓			✓
28	Ukranian Dorian	✓		✓	✓			✓	✓		✓	✓	
29	Marva	✓	✓			✓		✓	✓		✓		✓
30	Todi	✓	✓		✓			✓	✓	✓			✓
31	Whole Tone	✓		✓		✓		✓		✓		✓	
32	Chromatic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

The scale you choose to play in will be saved when you save the pattern.

You will see that when you select a different scale in ***Scales View***, the illumination of the pads in the upper two rows changes. If you are familiar with a piano keyboard, you will see that the arrangement of pads simulates the layout of keys over one octave (initially starting at C), with Row 2 representing the white notes and Row 1 the black notes. Note that Pads 1, 4, 8 and 16 are always disabled in this view, to allow pads 2 and 3, and 5, 6 and 7 to act as the black notes. The brightly lit pads are those that belong to the selected scale, the dim ones are the notes that don’t belong.

When you exit ***Scales View*** by pressing **Note** again, the upper two rows in **Note View** now contain the notes in the selected scale, over two octaves. There is one exception to this – Chromatic scale. With this scale selected all 12 notes in the scale are available, which means that only a one-octave keyboard is possible to accommodate them. The upper two rows in ***Note View*** now have the same layout as in ***Scales View***. In ***Expanded Note View***, a two-octave keyboard is presented with Chromatic scale selected.

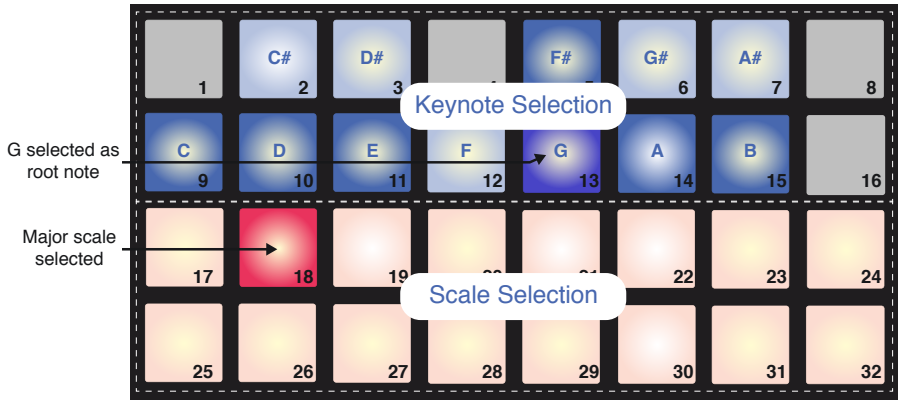


Chromatic Scale in Extended Note View

Root note

The default root note for all scales is C. In the **Scales View** shown at page 30, Pad 9, corresponding to C, is lit a darker blue than the other pads. To change the keyboard root note in ***Note View***, select a different note in ***Scale View***. (Note that the top two rows of ***Scales View*** *always* show an octave from C to B.) When a different root note is selected, the pad illumination changes to indicate the notes available in the currently selected scale for the new key.

For example, if you are working in the Major scale, and select G as the root note, the ***Scales View*** will look this:



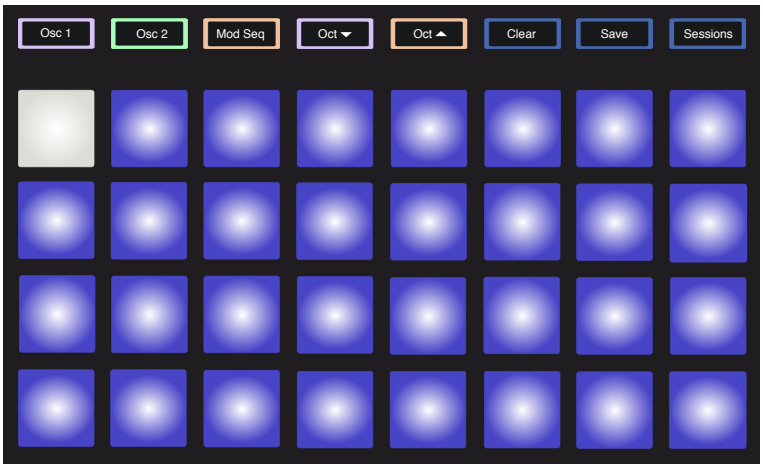
The upper two rows now show the notes making up the G major scale: G, A, B, C, D, E, and F#.

In ***Note View***, each of the two upper rows (or each of all four rows in ***Expanded Note View***) will now sound the notes of the G major scale, running from G to G' (where G' denotes a note one octave above G). The same principle can be applied to re-scale the synth note pads in the ***Note Views*** to any desired root key.

If you have already created a pattern including synth notes, you can change the keynote to transpose the pattern, even while the pattern is playing. You can also change the scale itself for an existing pattern. In this case, some notes in the pattern as it was created may not exist in the new scale. In such a case, Circuit Mono Station makes an intelligent decision as to which note to play instead, which will normally be either one semitone above or below the original note.

Selecting Patches

Circuit Mono Station has 64 memory locations for synth Patches, which define the synth's sound by assigning predetermined values to the various controls. All 64 memory locations are pre-loaded with factory Patches developed specifically for Circuit Mono Station. To load a Patch press the **Patches** button 10. This opens the ***Patch View Page 1***.



The two pages are selected with the **Oct** ▼ and **Oct** ▲ buttons 12. In Page 1, **Oct** ▼ is illuminated bright white and **Oct** ▲ dim white. Pressing **Oct** ▲ will open ***Patch View Page 2***.

Each of the pads in the grid represents 32 of the 64 factory Patches: Patches 1 to 32 are on ***Patch View Page 1*** and 33 to 64 are on ***Patch View Page 2***. To view the other page in the case of either synth, press the non-illuminated Octave button.

The pad corresponding to the currently selected Patch will be illuminated white and the others will be deep blue. To select a different Patch, press its pad: it will illuminate white and the previously pad will turn blue. The synth will now adopt the sound defined by the new Patch. You can change Patch while a Pattern is running, though the transition may not be absolutely smooth, depending on the point in the Pattern when the pad is pressed. Changing the Patch of a saved Pattern does not alter the Patch that was originally saved with the Pattern, unless the Session is re-saved.

Note that if you changing the Patch while listening to a demo Session (for example) may not sound quite like what you expected, as the Patch used for the Session will have had its parameters tweaked during Session creation.

The currently-selected Patch will be applicable to the whole of the current Session: you can't use different Patches for different Patterns in the same Session. However, Circuit Mono Station's extensive range of synth parameters should render this irrelevant in most cases.

Once you've made changes to one of the factory Patches, or created a new one from the initial Patch, you can save the result in one of the memory locations. In doing this, you will need to overwrite one of the factory Patches, so choose one you're not likely to need. In any event, the factory Patches can be easily reinstated using Novation Components. Full details about saving Patches and using Novation Components can be found later in this Guide.

Patch Preview
Patch Preview is a feature available in firmware version v1.1 onwards.

Patch Preview lets you audition a Patch while in ***Patch View***, making Patch selection very simple. You don't have to do anything: you will automatically hear the Patch as you select it. If you don't want the Patch to sound, hold down **Shift** 15 while pressing the grid pad: this will simply select the Patch as normal.

Initial Patch
You may sometimes want a very basic sound to work with. To meet this need, we've provided an Initial Patch (referred to elsewhere as "Init Patch"), which you can load quickly any time: you can tweak and add to until it's what you're after. To load Init Patch, open ***Patch View***, hold **Clear** 13 down and press any grid pad. This will temporarily overwrite Init Patch into that Patch memory, but the factory Patch will still be there next time you power-up. You can also* load Init Patch by pressing **Shift** 15 and **Patches** 10 together.

Init Patch isn't very interesting; it's intended as a "starting point" from which a more complex sound can be created. See "Initial Patch Parameters" on page 91 for a list of synth parameters for Init Patch. The initial sound for both Oscillators is a sawtooth waveform in the 8' pitch range with a medium release time. Init Patch is actually a good Patch to use to explore how the synth controls work, simply because it is so basic. The controls in the synth section are discussed in full detail elsewhere in the User Guide, but you can get an idea of the effect of each for now by tweaking and listening!

* on firmware versions 1.1 or later.

Programming a Pattern

To program a synth Pattern in Paraphonic Mode 1 (the default), first select a Patch as described in “Selecting Patches” on page 33. Enter ***Note View*** for Oscillator 1 (press **Note** and then **Osc 1** if not already selected).

To assign a note to a Pattern step, press and hold the pad for the step – it will turn red – and simultaneously press the pad for the note to be assigned, which will also turn red while it is being pressed. For example, if you want your Pattern to start with the scale root note (which will be C unless you’ve changed it) on beat 1 of the Pattern, press and hold Pad 17 (the first step in the Pattern) and then press Pad 9. When you run the sequence, the note of C will now play on step 1 of the 16-step Pattern. You can add further notes to other steps in exactly the same way. Note that once notes have been assigned to steps, the pads for those steps will illuminate bright blue.

Note that the two **Octave** buttons 13 have no effect on the pitch of the notes once they’ve been recorded; you need to decide which octave you’re going to play in at the time of recording. However, you can still alter the octave of the pattern after recording by holding down **Shift** when pressing **Octave**.

The two parameters in ***Scales View*** – Scale and Root Note – can both be altered during playback as well, so if you like the pattern, but it’s in the wrong key to fit with another musical element, you can just press **Scales** and select a different root note.

Using Paraphonic Mode 2 (see “Paraphonic voicing” on page 26), exactly the same procedure can be used to program Steps for Oscillator 2.

Step editing

Step editing operations in Circuit Mono Station may either be done with the pattern running (i.e., in Play mode), or not running (i.e., in Stop mode).

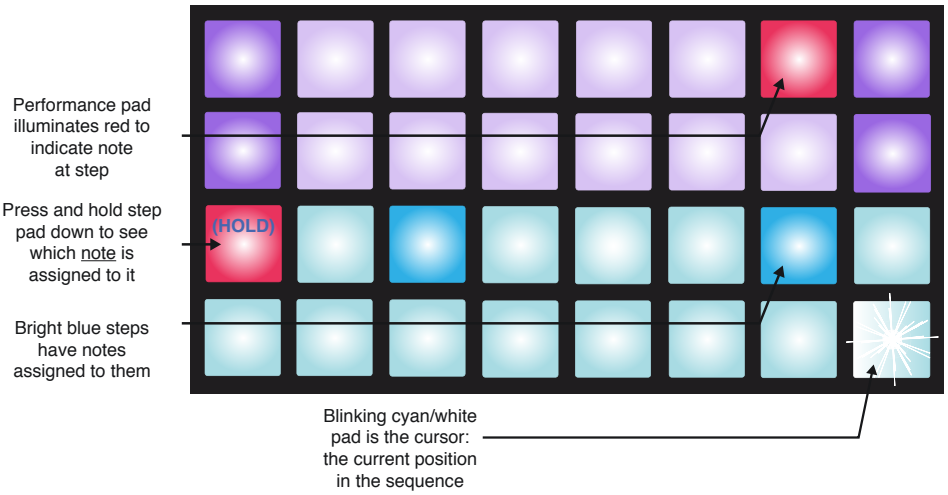
Circuit Mono Station gives you the means of adding or deleting individual notes in a pattern without needing to worry about accurate timing, as editing is step-based and doesn’t require the notes to be accurately entered.

All the following details apply equally – and independently - to Osc 1 and Osc 2. Press the **Osc 1** or **Osc 2** buttons to see the individual contributions of the two Tracks to the overall pattern. Bear in mind the need to select Paraphonic Mode 2 – by pressing **Shift** + **Scales** - to hear the Pattern assigned to Oscillator 2.

In ***Note View*** (but not ***Expanded Note View***), the two lower rows of grid pads represent the 16-step pattern and the two upper rows are the performance pads. When a pattern is played, you can see the white pad moving through the 16 steps. When a step has a note associated with it, the performance pad in the two upper rows corresponding to the note being played illuminates white while the note is sounding (but see the following page regarding octaves).

When the pattern is not playing, you can listen to the notes assigned to each step and alter the pattern manually. When the pattern is playing, you will only hear the notes associated with each step when the sequence gets to the step.

The pads for the steps which have notes associated with them will be illuminated bright blue. One step pad will flash white/blue: this shows where the pattern had reached when it was stopped. This is shown in the first diagram below. However, when you press **Play** again, the pattern will always restart from Step 1.



If a bright blue step pad (i.e., one corresponding to a synth note) is pressed and held, it illuminates red, the note at that step will sound, and the performance pad corresponding to the note will also illuminate red. The pad stays red and the note sounds for as long as the step pad is held down.

The above description holds good as long as the currently selected octave is the same as that used to record the note. (Remember that although you can't change the octave of a note once it's been recorded, you can shift the octave of the performance pads up or down when a pattern isn't playing.) If you press a brightly-lit step pad but no performance pad illuminates red, it means that the note you are hearing – the one recorded for that step – lies in another octave. Use the **Oct** ▼ or **Oct** ▲ buttons 12 to move to another octave to find where the note is: a performance pad (or pads) will light red when you hit the right octave. You can hold the step pad down while pressing the **Octave** buttons to do this. With a bit of listening practice, you'll be able to guess the octave a note lies in relative to the one the performance pads are currently set to.

Deleting notes

If a note is incorrect, you can easily delete it by pressing the step pad for the unwanted note (both the step pad and the assigned performance pad will then light red) and then press the performance pad. The note is deleted and performance pad will resume the colour of the other (unplayed) notes according to the oscillator being displayed – purple or green.

Inserting notes

You can add synth notes to a pattern by selecting the step where the note is to go by holding down the pattern pad for that step, pressing the required performance pad, and then releasing the pattern pad. You don't have to press Record. Now when you run the pattern, you will find that the note has been added.

You can also insert notes by reversing this sequence: you can select the note first by pressing and holding a performance pad and then pressing a Step pad to assign the note to that Step.

Remember that you can add notes in any octave, but the octave you select will determine the octave displayed on the performance pads, so if all your existing notes are in the mid-range and you want to add a bass note, the performance pads will not display any of the higher notes once you've selected a lower octave.

Other note alterations

If you want to change the note at a Step to a different note, simply assign the new note as described above, which will automatically cancel the previous one, as only one note may be assigned to each Step. The procedure needs to be done this way to retain the Gate and Velocity values for the original note. If you delete the original note and then enter the revised note, you will find that the new note has the default values for Gate and Velocity.

You can also alter the duration (Gate) and Velocity value of individual notes. These topics are covered in a subsequent section of the Guide.

Clear and Duplicate

Circuit Mono Station's Clear and Duplicate (**Shift** + **Clear**) functions can be applied to Patches, Patterns and Sessions as well as the individual steps in a Pattern. Here we are concerned only with Clearing and Duplicating steps.

Clearing Steps

You can also delete assigned synth notes from a step using the **Clear** button 13. This has the advantage that you don't have to search through the octaves to find a note that isn't in the currently-displayed octave.

Press and hold **Clear**; the button will illuminate bright red to confirm Clear Mode. Now press the step pad; it will turn red and the note for the selected oscillator at this step will be deleted. The step pad will revert to its dim "unassigned" illumination when this has been done. Release the **Clear** button to exit Clear Mode; its illumination will return to dim blue to confirm that the clear procedure is complete.

The Clear button has an additional function in ***Patches View***, ***Patterns View*** and ***Sessions View***; see "Initial Patch" on page 34, "Clearing Patterns" on page 51 and "Clearing Sessions" on page 89.

Duplicating Steps

Pressing **Shift** + **Clear** 15 and 13 enables the **Duplicate** function, which performs actions very similar to “copy-and-paste” for Steps.

In ***Note View*** for any of the Tracks – including **Mod Seq** - you can use **Duplicate** to copy the note at a step, complete with its various attributes, to a different step in the Pattern.

Duplicate is the shifted function of the **Clear** button 13: to copy step data from one step to another, press and hold **Shift** and **Clear** together: the Clear button will illuminate bright green. Press the pad in the two lower rows corresponding to the step to be copied (the ‘source’ step); it will illuminate green. Now press the pad corresponding to the step where the data is to be copied to (the ‘destination’ step); this will give a single red blink. All the note information in the source step will now have been duplicated in the destination. Any pre-existing note information in the destination step will be overwritten. Upon release, the **Clear** button will return to dim blue to indicate that the duplication procedure is complete. If you want to copy the note data to several steps, you can continue to hold the **Shift** and **Clear** buttons down, and simply repeat the “paste” part of the operation to the other steps.

Velocity, Gate and Glide

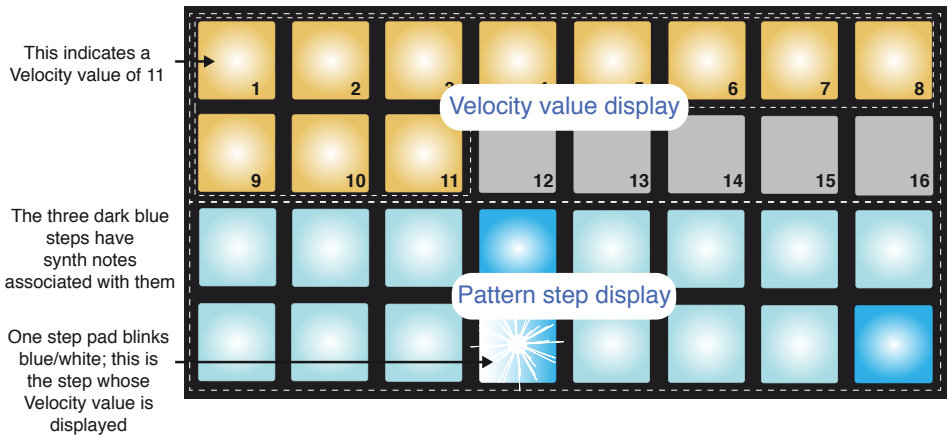
Every step in a pattern has three further parameters that are available to you to adjust. These are Velocity, which determines how the volume of a note is related to how hard the pad is struck, Gate, which sets the duration of the note, and Glide, which adds a portamento effect to a note.

Velocity

The velocity parameter measures how hard the pad is hit during Live Record, and can be subsequently edited. What the Velocity parameter then controls will be determined by what it is routed to in the Modulation Matrix. If it is used to control the VCA (by selecting **Vel** as the Matrix source and **Amp** as the Matrix destination), it will be directly related to volume, and can be scaled – as can any other Modulation Matrix routing – with the **Depth** control 40.
See page 82 for full details of how to use the Modulation Matrix.

In Live Record, Velocity values are assigned to each step as you play the performance pads. Note that Velocity values are associated with the Pattern step, not with the note.

Circuit Mono Station lets you change the Velocity value of a step to any of 16 values, after you’ve created a Pattern. This is done in ***Velocity View***, which is selected by pressing **Velocity** 6, which illuminates in the colour of the currently selected Oscillator.



In ***Velocity View***, the two lower rows of the grid represent the pattern steps. In the 16-step example shown above, Steps 4, 12 and 16 are brightly lit, indicating that these steps have notes associated with them. One pad in the Pattern step display will flash alternate white/blue: this is the step whose Velocity value is being displayed.

The two upper rows of the grid make up a 16-segment "bargraph" meter; the number of pads illuminated white is the Velocity value for the selected step. In the example shown, the displayed Velocity value is 11 (equivalent to an actual Velocity value of 87 – see below): the remainder of the Velocity value display is unlit.

If you record in real time – i.e., while the sequencer is running and recording – the velocity value is set internally to 7-bit accuracy: a value between 0 and 127. ***Velocity View*** cannot accurately display the value of the Velocity parameter to its full resolution because there are only 16 pads available. This means that you are likely to see the "last" pad in the display lit at a lower brightness. For example, if the Velocity value is 100, you will see Pads 1 to 12 fully lit, and Pad 13 dimly lit, because the value of 100 lies midway between two multiples of eight. The table below shows the relationship between actual Velocity values and the pad display:

No. of lit pads	Velocity value	No. of lit pads	Velocity value
1	8	9	72
2	16	10	80
3	24	11	88
4	32	12	96
5	40	13	104
6	48	14	112
7	56	15	120
8	64	16	127

You can change Velocity value when the Pattern is stopped by pressing the pad in the Velocity value display rows that corresponds to the required value. If you wanted the note(s) at Step 12 in the example above to have a Velocity value of 48 instead of 88, you would press pad 6; Pads 1 to 6 now illuminate white. If you want to increase a Velocity value, press the pad corresponding to the required value. Because of the restriction of only having 16 pads, when editing Velocity you can only assign a value that is a multiple of 8.

You can also use ***Velocity View*** to change Velocity values while a pattern is playing. In this case, you need to press and hold the pad for the step to have its Velocity value changed; you can do this at any point in the pattern. The held step pad will illuminate red, and the two upper rows will "freeze" to display the Velocity value of the selected step. Press the Velocity pad corresponding to the new value required. The pattern continues to play, so you can experiment with different Velocity values in real time and hear the differences.

Fixed Velocity

You may sometimes prefer to disable Velocity; then the notes comprising your synth sequence will have a more “mechanical” feel to them regardless of how you hard you actually strike the pads. Circuit has a Fixed Velocity function, which sets Velocity at a value of 96.

Fixed Velocity is enabled by pressing **Velocity** 6 while holding down **Shift** 15. Fixed Velocity is confirmed by the **Velocity** button illuminating white while Shift is pressed.

You will now find that all the synth notes that you have just played have a Velocity value of 96 (12 pads lit).

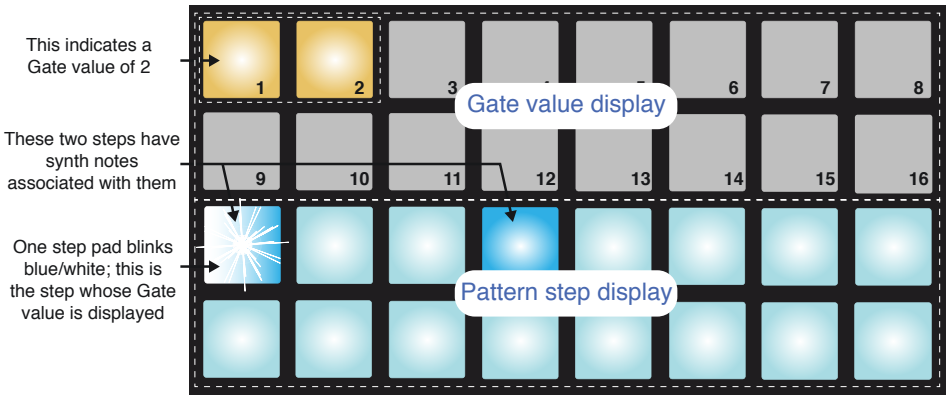
Note that setting Velocity to Fixed does not alter the Velocity values of notes previously recorded.

Gate

Gate is essentially the duration of the note at a Step, in units of steps. The Gate parameter is not restricted to integer values, fractional values are also allowed: It may have any value between one-sixth and 16, in increments of one-sixth of a Step, giving a total of 96 possible values. The number represents the time – in the number of steps - for which the notes at the step will sound.

Gate values are assigned to each note as you play the performance pads; Circuit Mono Station quantizes them to the nearest of the 96 possible values. A short stab at a performance pad will result in a low Gate value; if you hold a pad down for longer, the Gate value will be higher. A Gate value of 16 means that notes at that step will sound continuously for the entire pattern.

Circuit Mono Station lets you change the Gate value of a step after you’ve created a pattern. This is done in ***Gate View***, which is selected by pressing **Gate** 6.

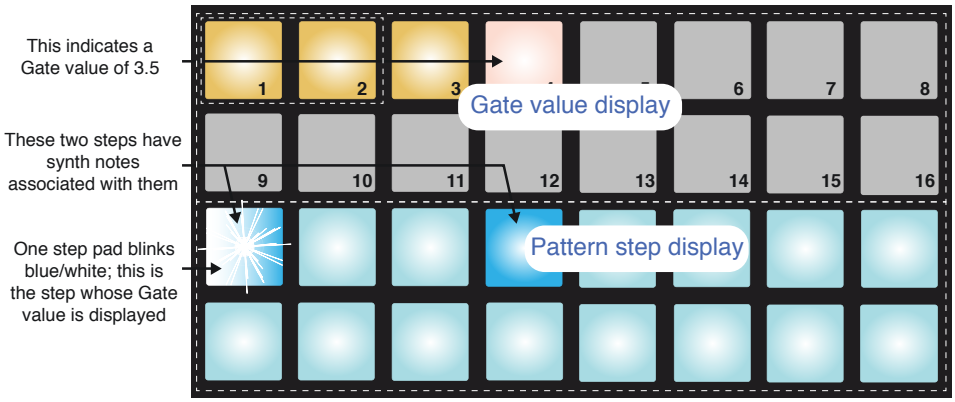


In ***Gate View***, the two lower rows of the grid represent the pattern steps. In the 16-step example shown above, Steps 1 and 4 are brightly lit, indicating that these steps have notes associated with them. One pad in the Pattern step display will flash alternate white/blue: this is the step whose Gate value is being displayed.

The two upper rows of the grid make up a 16-segment “bargraph” meter; the number of pads illuminated white is the Gate value for the selected step. In the example shown above, the Gate value is 2: the remainder of the Gate value display is unlit.

You can change the Gate value by pressing the pad in the Gate value display rows that corresponds to the Gate value; that is, the number of pattern steps that the note at the step should sound for. If you wanted the note at Step 1 in the example above to sound for four steps instead of two, you would press pad 4; Pads 1 to 4 now illuminate white. If you want to shorten a Gate value, press the pad corresponding to the required value. The rule is: press the pad corresponding to the actual number of steps that the note(s) should sound for.

Fractional Gate values are assigned by pressing the highest-numbered illuminated pad in the Gate value display an additional number of times: this will always shorten the Gate time. Each additional press reduces the Gate time by one sixth of a step, and the illumination dims incrementally at each press. Thus if a Gate duration of 3.5 was required for Step 1, the example above would look like this:



After the fifth press on the pad, the Gate time reverts to the former integral value on the sixth, and the pad resumes its original full brightness.

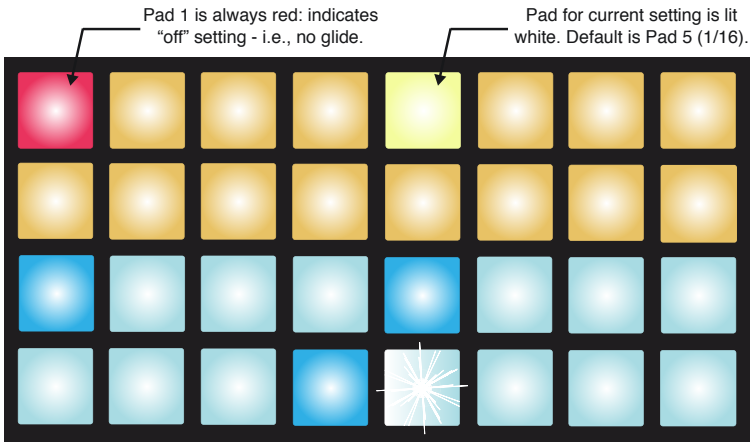
You can also use ***Gate View*** to change Gate values while a pattern is playing. In this case, you need to press and hold the pad for the step to have its Gate value changed; you can do this at any point in the pattern. The held step pad will illuminate red, and the two upper rows of Gate View will “freeze” to display the Gate value of the selected step. Press the pad corresponding to the new value required. The pattern continues to play, so you can experiment with different Gate values in real time.

Pattern steps with no notes have a zero Gate value; all Gate pads in ***Gate View*** for such steps will be unlit. You can’t edit a step’s Gate Value if no note is assigned to that step.

Glide

You can add pitch glide (portamento) to any or all of the steps in a Pattern. It can be added to the Pattern Steps for either Oscillator independently. Adding Glide to a step means that the note assigned to the step will initially not be played at its normal pitch: it will ascend or descend to its normal pitch over a period determined by the Glide Time setting. The initial pitch will be that of the previously played note, so the glide will be a fall or a rise in pitch according to whether the previous note was above or below the one at the step in question.

Glide settings are made in ***Glide View***, which is opened by pressing **Shift** 15 and **Gate** 6 together.



The lower two rows in Glide View show the Pattern steps, as in other Views. The upper two rows allow the Glide Time to be set for each step, to one of 16 values between 0 and 127, according to the following table:

Pad	Glide value
1*	**Glide Off**
2	8
3	17
4	25
5	34
6	42
7	51
8	59
9	68
10	76
11	85
12	93
13	101
14	110
15	118
16	127

* Default value

You can assign a Glide Time to a Step in either Play or Stop modes. The Pads for the Steps that have notes assigned to them will be illuminated brightly; to add Glide, press and hold the Step Pad and press the Pad corresponding to the required Glide Time. When the Pattern runs, you will see that the Glide Time value is now indicated for that Step by the Glide Time Pad illuminating brightly. You can add Glide to other Pattern Steps in the same way.

However, there is an important difference in the way Glide works, compared to Gate and Velocity, for example. Glide values are not assigned to individual Steps simply as a per-Step attribute. When Glide is added to a Step, it acts as a “Glide On” instruction at that Step. The value of Glide used will be then applied to every Step in the Pattern from that point, so its effect will be heard on every note in the Pattern - unless its value is changed at a subsequent Step. So if you only want Glide at one Step, you can assign the amount of Glide you want at that Step, and then set Glide to zero at a subsequent Pattern Step. It will then act as a “Glide Off” instruction.

Glide Time may be assigned to any Step in the Pattern, including Steps that do not have notes assigned to them. It is important to remember that Glide is added to Steps, not Notes.

A possible consequence of adding Glide is that the note assigned to a Step may no longer be heard at its original pitch. This will occur if the Glide Time is longer than the number of Steps between the note and the previous note: the glide effect will not have time to reach the “target” pitch. The duration of some notes in a Pattern may also need to be considered, both in terms of release time and Gate value.

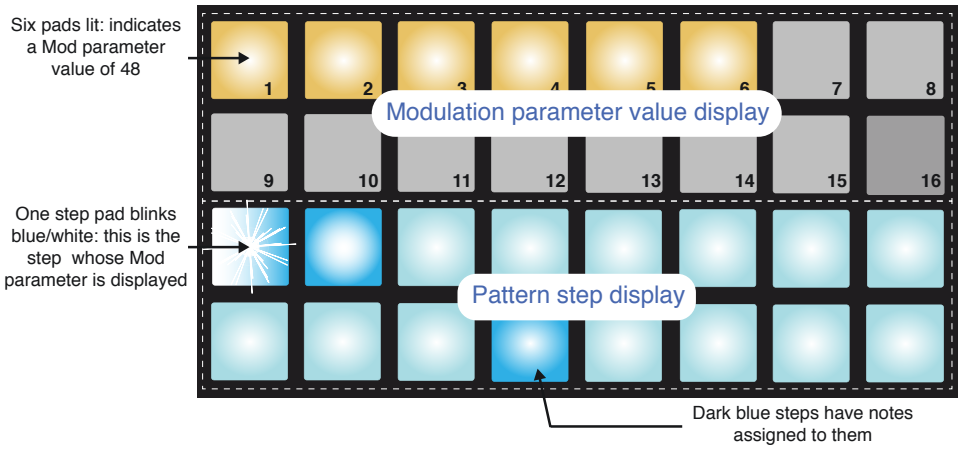
You can “thicken” a note up by adding a short glide to it: if the glide time is short enough, it will not be heard as an actual pitch change, but more as the note having more “body” to it.

The Modulation Sequencer

The Modulation Sequencer (**Mod Seq**) is a "virtual" third Track that can record a Modulation parameter value for each Step in a Pattern. The Track is saved to the Pattern along with the Tracks for Osc 1 and Osc 2, and in all other respects is handled simply as an additional sequencer track.

The data recorded in Mod Seq is available to the Modulation Matrix as one of its four sources (**Seq**). It can then be routed to any of the eight Matrix destinations to vary oscillator pitch, pulse width, VCA level, filter frequency, etc. See page 82 for full details of the Modulation Matrix.

Pressing **Mod Seq** 5 opens ***Modulation Sequencer View***:



Although the value of the Modulation parameter is stored internally at 8-bit resolution (0 to 127), the restriction of 16 pads means it may only be assigned in multiples of 8, as per the table below:

No. of lit pads	Mod value	No. of lit pads	Mod value
1	8	9	72
2	16	10	80
3	24	11	88
4	32	12	96
5	40	13	104
6	48	14	112
7	56	15	120
8	64	16	127

The default value of the Modulation parameter for all Steps in a Pattern is zero, so Pads 1 to 16 will initially all be unlit (unless you are looking at the ***Modulation Sequence View*** for a pre-programmed Session). To assign a Mod value to a Step, press and hold the corresponding pad in the Pattern Step display and press the pad in the upper two rows to assign the value. If you want a Mod parameter value of 48, press Pad 6 and Pads 1 to 6 will all illuminate orange. As the Pattern plays, the grid will show the Mod Seq value assigned to each Step by lighting up pads in the two top rows.

To reset the Mod Seq value to zero at a particular Step, hold **Clear** 13 and press the pad in the Pattern Step display for the Step; the Mod parameter display on the upper two rows will go dark.

Remember that Mod Seq will have no effect on the sound unless it is assigned in the Modulation Matrix, and the **Depth** control is turned up or, in most cases, down (either way, the LED should be lit orange). Consider **Depth** as a scaling control for the Mod Seq values you have assigned, just like the Mod Wheel on other synths.

Smooth
Because Mod Seq parameter values are effectively assigned in increments of 8, there will always be a "jump" in the amount of modulation that is being applied to the chosen destination when subsequent Pattern Steps have different Mod Seq values. This jump will obviously be amplified when different Mod Seq values are assigned to adjacent Steps.

The effect of this on the sound may be negligible - or even inaudible; or it may be a bit annoying. To overcome this, you can engage Smooth Mode, by pressing **Shift** and **Mod Seq** together. This interpolates between the discrete Mod Seq values, and causes the modulation to change value gradually between steps, minimising the jump.

Note that the glide introduced by Smooth Mode has a fixed rate, and thus at higher tempos and sync rates, the modulation depth at the next Pattern step may not have time to reach the desired value.

When Smooth is active, the **Mod Seq** button will light bright white when **Shift** is pressed; when Smooth is Off, the **Mod Seq** button will be dim white when **Shift** is pressed.

Recording a Pattern in real time

To record a Pattern in real time, first select a Patch. Enter ***Note View*** for Oscillator 1 (press **Note** and then **Osc 1** if not already selected) and run the pattern by pressing  Play.

If you want your notes to extend over four octaves rather than two (or two rather than one if you've selected Chromatic scale), select ***Expanded Note View*** instead (**Shift** + **Note**). You can "audition" the notes simply by playing the pads – they won't be recorded until you press a step button as well.

When you're ready to save them to the pattern, press **Record** and carry on playing; after the pattern has completed 16 steps, the notes will be replayed.

While you're in Record, the step cursor (normally white) changes to red as it progresses through the pattern as an additional reminder that you are now about to alter the pattern. The Mixer level controls for Osc 1 and Osc 2 also turn red.

Once you've played the required notes, press **Play** again to stop recording and to halt the sequencer.

You can also delete or add notes "manually" – that is, while the Pattern isn't running. If you're working to a fast tempo, this is often easier.

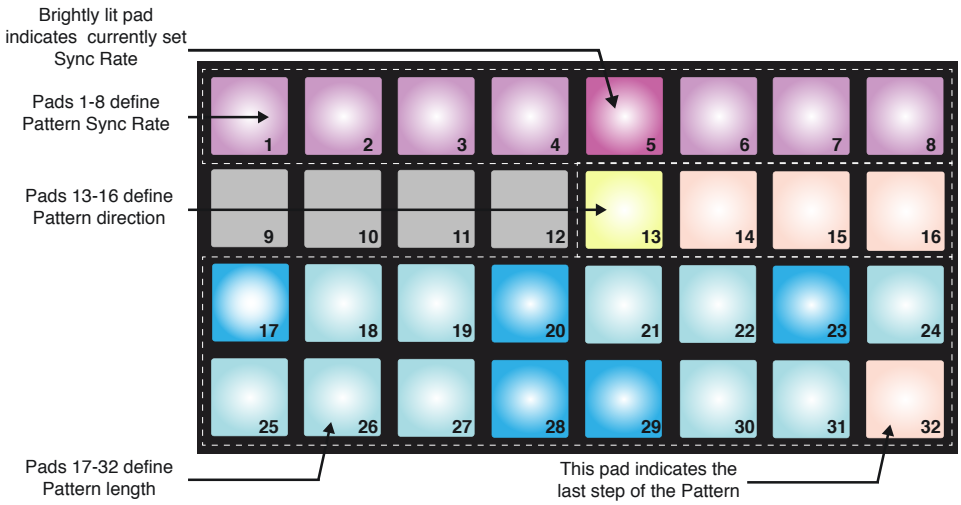
Notes recorded “live” in this way will be quantised in time to the nearest step of the sequence. They will also have values for Gate (how many steps the note sounds for) and Velocity (volume proportional to how hard you strike the pad). ***Gate View*** and ***Velocity View*** both display their respective values to an accuracy of 96 levels (see page 38).

Now you can add notes from Oscillator 2 to the sequence. Select **Paraphonic Mode 2** by pressing **Shift** and **Scales** together and ensure Osc 2 is turned up in the Mixer section. Switch to Oscillator 2’s ***Note View*** and record in the same way. Remember, in Paraphonic Mode 2, you can hear the notes being played in the same way as for Osc 1.

Pattern Settings

Although the default length of Patterns in Circuit Mono Station is 16 steps, you can change the length to a something shorter. This is done in ***Pattern Settings View***, opened by pressing **Pattern Settings** 7. As well as defining the Pattern length, ***Pattern Settings View*** also lets you choose the “direction” of the Pattern and set the Sync Rate for the Pattern.

The *Pattern Settings View* will look something like this:



Note that Pattern Settings may be made independently for Oscillator 1, Oscillator 2 and the Modulation Sequencer. This opens up the possibility of “superimposing” relatively short Patterns of differing lengths and tempos to create interesting, much longer non-repeating sequences.

The pad grid is divided into three functional areas: Pads 13-16 select Pattern direction, Pads 17-32 control Pattern length and Pads 1-8 select the Pattern Sync Rate. Note that Pads 9-12 have no function in this View and are unlit.

Pattern direction

The default Pattern direction is “forwards”, indicated by Pad 13 being brightly illuminated. The selected Pattern will always start at Step 1, proceed to the last Step defined in Pattern Length (the default being Step 16) and then repeat.

Three other options are available:

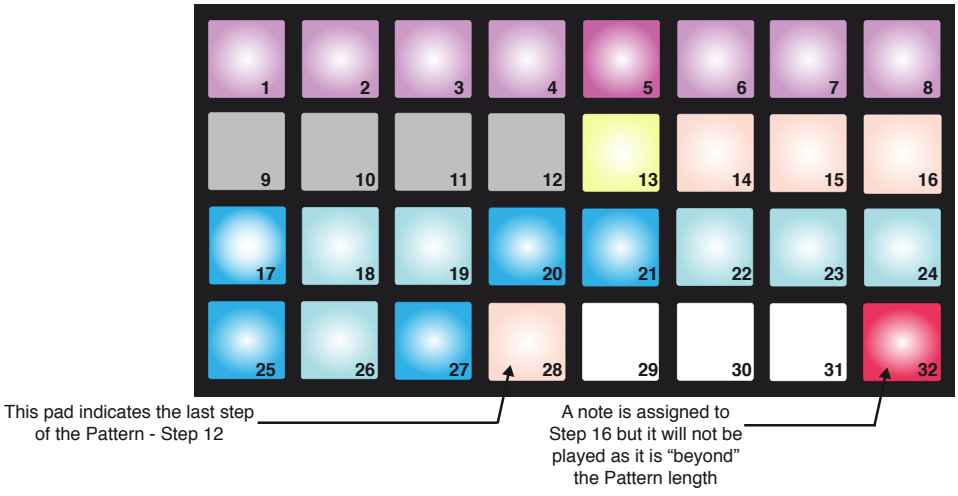
- **Backwards** (Pad 14) – the Pattern will start at the last defined Step, and play backwards to Step 1 before repeating.
- **Ping-Pong** (Pad 15) – the Pattern will first play forwards to the last defined Step and then backwards to Step 1. This means that the Pattern length is doubled, and also that the last and first Steps in the Pattern are played twice as the play direction reverses.
- **Random** (Pad 16) – all Steps in the Pattern (within its defined Length) are played in random order. Note that this includes Steps with no notes.

Pattern length

The default length for a Pattern is 16 Steps: the last Step is indicated in ***Pattern Settings View*** by one of the sequencer pads being illuminated in a “sand” colour, either dimly if no note is assigned to it, or brightly if one is. In the example View above, Step 16 is the last Step in the Pattern and has no note assigned.

Press a different pad in the two lower rows of ***Pattern Settings View*** (17-32) to shift the end point to an earlier Step, which will define a shorter Pattern length. For example, pressing Pad 28 will set the Pattern length to 12 steps, removing the last four steps from the Pattern as played. As noted above, the last Step to be played is indicated by a different colour of illumination: the pads “after” this Step will be unlit, unless any of them have a note assigned, in which case they will glow dim red. The remaining pads in the Pattern grid will either be dim blue (no notes assigned) or bright blue (notes assigned).

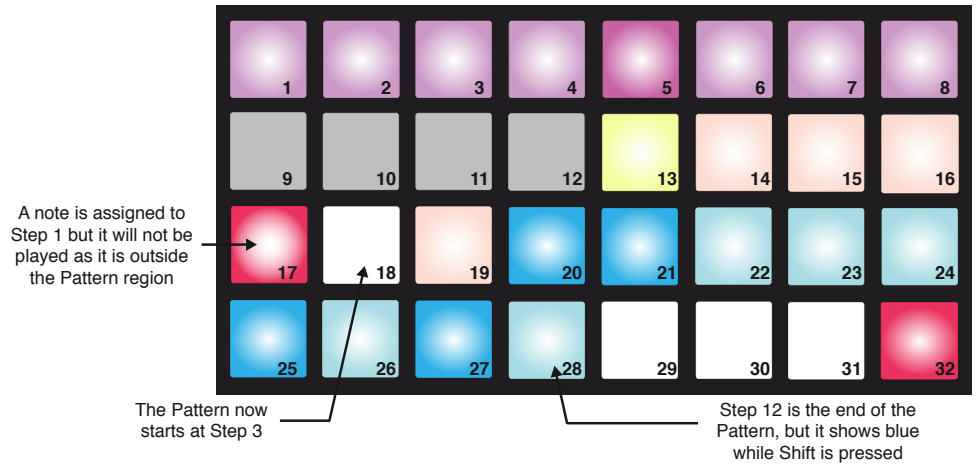
In the example below, the Pattern length is 12 Steps. Notes are assigned to Steps 1, 4, 5, 9 and 11 and also 16, which is now beyond the Pattern length and thus will not be heard. However, notes assigned to Steps now outside the Pattern length are stored and will be reinstated if the Pattern length is increased to include their Steps.



In exactly the same manner, you can also alter the length of a Pattern by moving the start Step to a later point. To do this, hold down **Shift**, and press the pad corresponding to the new start point. As described above, the “earlier” step pads will then either be unlit (no notes assigned) or dim red (note assigned). Pressing **Shift** any time after this will indicate where the start Step is by illuminating it in the sand colour, either dimly (no note assigned) or brightly (note assigned); the end Step will change to blue while **Shift** is being pressed.

Thus you can edit a 16-step Pattern to be any length, and position the start and end points at any point. You can even move the end point to a Step before the start point, in which case the Pattern will still play the region defined by the two points by allowing for the “loop-round” at the end.

In the example shown below, the above example has the start point shifted to Step 3, so the Pattern is now only 10 Steps in length. The colours are as they will appear when **Shift** is pressed.



Pattern Sync Rate

Pattern Settings View also provides a convenient method of changing the tempo of a Pattern to a musically-related multiple or sub-multiple of the tempo. The top row of the View (Pads 1 to 8) select the “multiplying factor” according to the table below (T=triplet rate):

Pad	Sync Rate	Tempo factor
1	1/4	Quarter speed
2	1/4 T	
3	1/8	Half speed
4	1/8 T	
5*	**1/16**	**Default speed**
6	1/16 T	
7	1/32	Double speed
8	1/32 T	

* Default value

The Sync Rate settings are based on semiquaver Steps; that is, sixteen semiquaver beats to a bar in 4/4 time. At the default sync rate setting of 1/16, the Pattern will be played at the BPM rate set by the **Tempo** control 2. Selecting a Sync Rate of 1/8 by pressing Pad 3 will play the Pattern at half the tempo or at double the tempo by selecting 1/32. The Gate times for each note are correspondingly adjusted to maintain the correct relative musical intervals. Note that if the Sync Rate is changed while a Pattern is playing, it will first complete its full cycle - in the case of Forwards and Backwards Pattern directions - before recommencing at the revised tempo. If Ping-Pong direction is selected, the change of tempo occurs at the first or last Step in the Pattern, whichever occurs first. With Random direction, the tempo change will occur when the number of steps in the Pattern has been played.

Sync Rate selection is especially useful when slaving Circuit Mono Station to a source of external tempo clock.

STORING PATTERNS

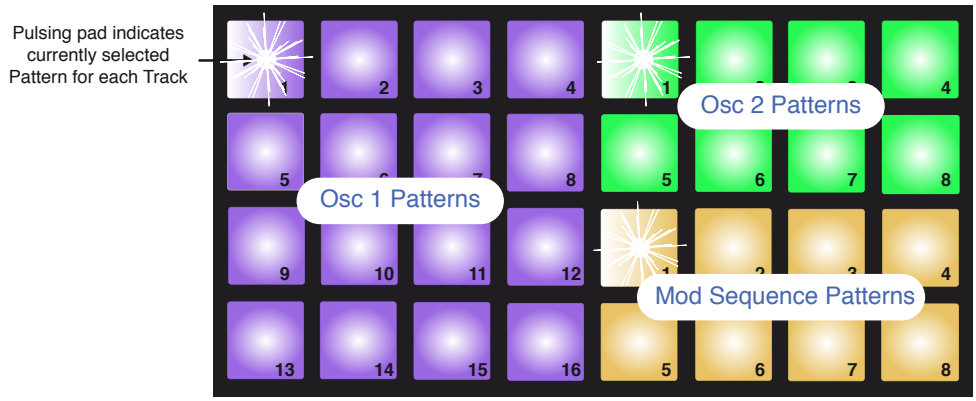
Each Circuit Mono Station Session has memory space for storing multiple Patterns per Track: you can save sixteen Osc 1 Patterns, eight Osc 2 Patterns and eight Modulation Sequencer Patterns within one Session.

The true potential of Circuit Mono Station begins to be realised when you start to create interesting variations of a Pattern, save them, and then chain them together to be played out as complete sequences of up to 256 (16 x 16) steps. Furthermore, not all the Patterns for each Track need to be chained in the same way: you could have 32-step Osc 1 Patterns combined with a longer sequence of Osc 2 Patterns, for example. There is no restriction on how you combine the Patterns from different Tracks (though there is a restriction on how the Patterns for individual Tracks are chained; this is explained in “Pattern Chains” on page 52).

Saving a Pattern is effectively automatic. The currently-selected Pattern memory for the Oscillator in use will retain the Pattern being created. If you’re happy with the Pattern, you don’t have to do anything, it will be in the memory. However, each set of 32 Patterns will need to be saved as part of the current *Session* if you want to use the Patterns next time you power up.

Patterns View

To see how Patterns are arranged and selected, use ***Patterns View***, accessed by pressing **Patterns** 9. The first time you open ***Patterns View*** in a new Session, it will probably look like this:



The grid is vertically divided into three areas: the first four columns of pads represent the sixteen memories for Oscillator 1 Patterns, the remaining four are divided horizontally between Oscillator 2 Patterns and Modulation Sequence Patterns. Each of the Pattern memories can contain a 16-step pattern.

How each pad is lit indicates its status. A dimly-lit pad means that the Pattern is not currently selected. One pad per track will be pulsing slowly between dim and bright: this is the Pattern that was playing when Play was last stopped. Initially (i.e., when a new Session is started), Pattern 1 in each track will be in this state with all the other memories empty (and the pads consequently dimly lit).

To select a different Pattern for any Track, simply press its pad. You can do this in Stop or Play Modes; an important feature of the pattern sequencing is that if you select a Pattern while another is already playing, the first will play to the end of the Pattern before the new Pattern starts playing. This gives you a smooth transition between Patterns. In this case, the pad for the newly selected track will flash quickly while it is being “cued”, until it starts to play.

The currently selected Pattern is the one used in both Play and Record Modes: this makes operation very simple and transparent. The current contents of the selected Pattern (if any) will play when you press **Play**, and if you add extra notes in Record or Live Record Modes, they will be saved to the same Pattern.

Every time you press **Play**, the Pattern restarts from Step 1 (or the last Step in the Pattern if Backwards direction is selected in ***Pattern Settings View***). You can restart the Pattern from the point at which the sequencer was stopped by pressing **Shift** and **Play** together.

Circuit Mono Station also offers Instant Pattern Switching. While in Play mode, if you hold down **Shift** 15 while selecting a Pattern, the new Pattern will begin to play immediately instead of waiting for the current Pattern to complete. The new Pattern will begin at Step 1 regardless of where the play cursor was in the previous Pattern and will play its first Step with the same timing as previously: Pattern tempo is always maintained.

> If your Pattern has slipped out of time due to the introduction of odd Pattern lengths and/or unusual sync rates, Instant Pattern Switching is a quick way of getting back in time.

Clearing Patterns

Pattern memories may be cleared in ***Patterns View*** by holding down **Clear** 13 and pressing the pad for the Pattern to be cleared. Both **Clear** and the pad itself will light bright red while you press them to confirm deletion.

Duplicating Patterns

In ***Patterns View***, the **Duplicate** function can be used to perform a simple copy-and-paste function, letting you copy a Pattern from one memory to another. This is a very useful feature, as it lets you use an existing 16-step pattern as the basis for another, slightly different one: it is often easier to modify an existing Pattern to be how you want it than create a new one from scratch.

To copy a Pattern, hold down **Shift** 15 and press **Clear** 13 together (**Clear** lights bright green), press the pad with the Pattern you want to copy (it lights green while you press it), and then press the pad corresponding to the memory that should contain the copy (it will light red). You now have a duplicate of the Pattern in the first memory in the second. If you want to copy the Pattern data to several memories, you can continue to hold the **Duplicate** button down, and simply repeat the "paste" part of the operation to the other steps.

> Note that you can copy an Osc 1 Pattern to an Osc 2 Pattern memory, or vice-versa. However, Mod Seq Patterns can only be copied to other Mod Seq Pattern memories.

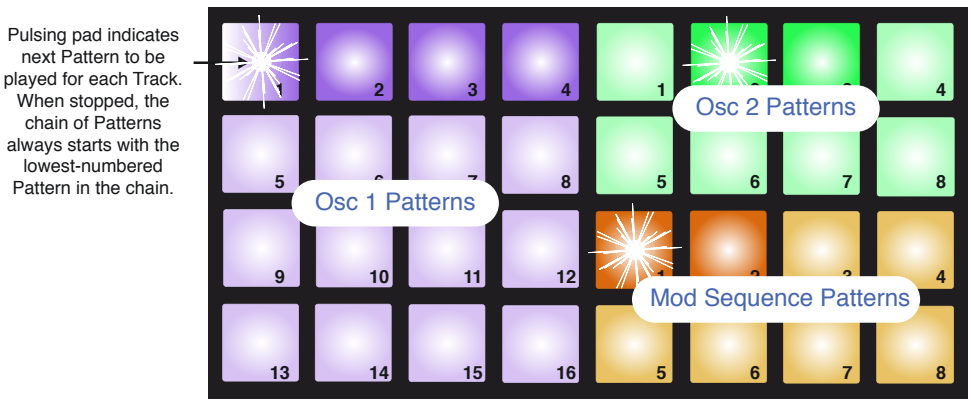
Pattern Chains

Once you've created several Patterns, you can start to chain them together to make a longer sequence. You do this on a per-Track basis: to chain four Patterns together on a Track, press and hold the pad for the lowest-numbered Pattern required and then press the pad for the highest-numbered Pattern required. For example, if you want to chain the Patterns in memories 3 to 6 together on a Track, hold Pad for memory 3 down and then press the Pad for memory 6. You'll see that all four pads now illuminate brightly in the track colour, to confirm that they are all now part of the chained sequence.

You can form chains of Patterns for Osc 1, Osc 2 and the Modulation Sequencer independently of each other, or you can just have a chain with Osc 1 Patterns only. Note though that all Tracks will have an "active" Pattern, and any data in the selected Pattern memory for Osc 2 and the Modulation Sequencer will be replayed, so if you just want to use Osc 1 on its own, ensure that the other two Tracks are playing an empty Pattern memory.

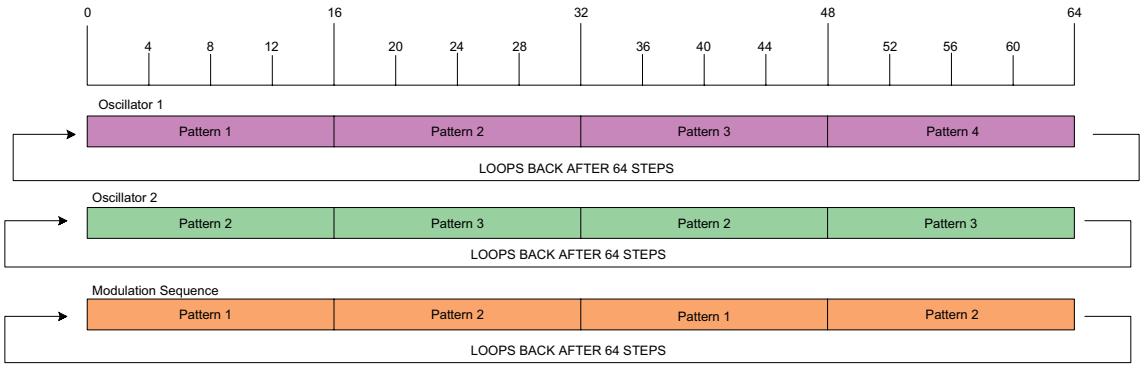
IMPORTANT: Patterns chained together must be *contiguous*, that is, numerically consecutive. You can chain Patterns 1, 2, 3 and 4 together on any one Track, or 5, 6 and 7 together, or 4 and 5 together, but you *can't* chain 1,2 and 6 together.

The following example illustrates these points.



The Pattern View example above shows a possible arrangement of Patterns for a 4-pattern (64-step) sequence. We are using four Osc 1 Patterns (Memories 1 to 4), two Osc 2 Patterns (Memories 2 and 3) and two Modulation Sequence Patterns (Memories 1 and 2).

When you press Play, each track will loop round its own chain of Patterns. The longest chain is Osc 1 – this defines the overall length of the sequence, in this case, 64 steps. Thus the sequence will be based on Osc 1 Patterns 1 to 4, which will play in that order and then loop back to Pattern 1 and start again. At the same time, Osc 2 will play Patterns 2 and 3 through twice, while the synth will respond to the control data in the Modulation Sequence Patterns 1 and 2 twice. What you hear is illustrated in the timeline below:



Every time you press **Play**, the Pattern restarts from the beginning of the first Pattern in the chain. You can restart the Pattern from the point at which the sequencer was stopped by pressing **Shift** and **Play** together.

The above example illustrates the basic points involved in chaining Patterns together to make a longer sequence. It assumes that all the Patterns are 16 Steps in length, though of course they need not be; in fact sequences can become very interesting when Patterns of different length are chained, and/or Tracks with Patterns of different length are used together. Creating longer, more complex and more interesting sequences is merely an extension of these principles. Circuit Mono Station allows sequences of up to 256 steps.

Pattern Octave

You can shift the pitch of an entire Pattern up or down one or more octaves by holding down **Shift** 15 and then pressing **Oct** ▼ or **Oct** ▲ 12. You can do this either while the Pattern is playing, or in Stop Mode. Note that you cannot change Pattern Octave while in ***Pattern View*** or ***Patches View***. Only the pitch of the currently selected oscillator is adjusted, that of the other will remain unaffected.

If the Pattern contains notes which are already in the highest octave that Circuit Mono Station can generate, they will remain unaffected by an upward Pattern Octave shift; the same applies to the lowest notes and a downward octave shift. If this is the case, the **Oct** button will light red to indicate that the command cannot be fully complied with.

Mutate

Mutate is an interesting feature that shuffles the notes making up a Pattern or a Pattern Chain (if one is currently defined). The effect of Mutate is to reassign the notes in a Pattern to different Steps, while retaining the Pattern Length, Sync Rate and other Pattern parameters. The same notes are played, but because the reassignment is a shuffle action, they will be in a different order and with different timing, though the overall Pattern tempo is maintained.

Mutate causes a one-off rearrangement, and is actioned by pressing the **Shift** and **Pattern Settings** buttons together. The notes are assigned to different Steps and the Pattern will continue to loop around the defined Pattern Length using the new assignment. If a Pattern Chain is in use, each Pattern making up the chain will be individually mutated, but the Patterns will continue to be played in the normal sequence.

Pressing **Shift** + **Pattern Settings** again performs another Mutate action: you can do this as many times as you wish.

Mutate is a destructive function – you can't cancel it to get back to your original Pattern or Pattern Chain. Therefore it's a good idea to make a copy of the Pattern(s) first using the **Duplicate** function before using Mutate.

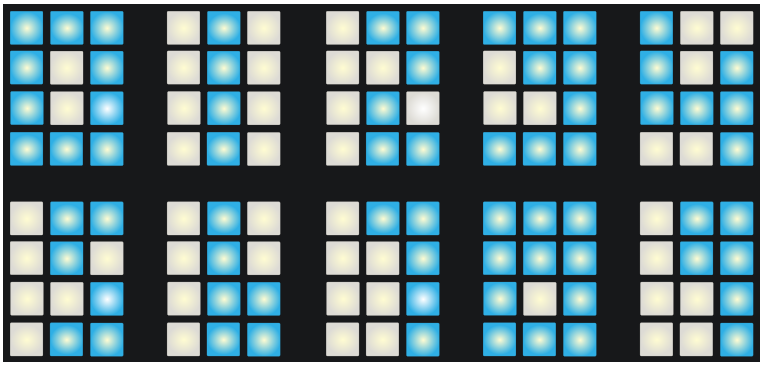
TEMPO AND SWING

Tempo and Swing are closely related and the methods of adjusting them are very similar.

Tempo

Circuit Mono Station will operate over a wide range of tempos. The tempo can be set by the internal tempo clock in the range 40 to 240 BPM (with a default tempo of 120 BPM), or, if you are working with other MIDI devices or a DAW, by an external MIDI clock source in the range 40 to 240 BPM.

To display the current BPM of the internal tempo clock, “nudge” the **Tempo** control 2 slightly. The BPM is displayed on the pad grid as two or three large digits in blue and white. The “hundreds” digit (which can only ever be a “1”, “2” or off) occupies grid columns 1 and 2, while the “tens” and “units” digits occupy three columns each, How the digits 0 to 9 are depicted is illustrated below.



The tempo may be adjusted by turning the **Tempo** control further. If it is not turned, the tempo display times out after 1.6 seconds and the grid display reverts to the previous View.

External clock

Circuit Mono Station may be slaved to an external MIDI clock. Internal/external clock selection is made in ***Settings View***; see page 86 for full details. Once external clock is selected, a valid clock signal will be used as the clock source once detected, and the grid will display the work “SYN” in red and white. External MIDI clock can be applied either via USB or the MIDI IN break-out cable; the TRS **MIDI IN** 3 will take priority over the USB port 8 if both receive valid clock signals.

While the internal tempo clock only allows discrete numbers of BPM (i.e., no fractional tempo values), Circuit will synchronise to any external clock rates – including fractional values - in the range 40 to 240 BPM.

If an external clock is removed (or goes out of range), Circuit Mono Station will stop playing and revert to the internal clock. The “SYN” display will remain visible until **Play** button is pressed (i.e., cancelled). The display will then show the BPM value that was saved with the Session and the **Tempo** control can now be used to adjust the tempo.

Tap Tempo

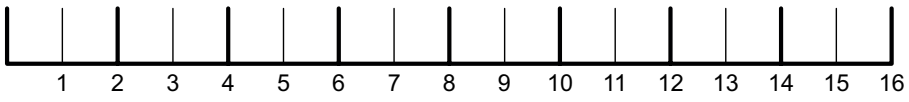
If you want to match Circuit Mono Station's tempo to another piece of music and you don't know its BPM, you can use Tap Tempo. Simply tap the **Tap** button [3] in time with the track you're listening to - use ¼ notes (crotchets). You need at least three taps for the tempo to change to your manual input, and the BPM will then be calculated by averaging the last five taps.

You can use Tap Tempo at any time, but you will need to "nudge" the **Tempo** control in order to see the BPM display, which will then show the tap tempo.

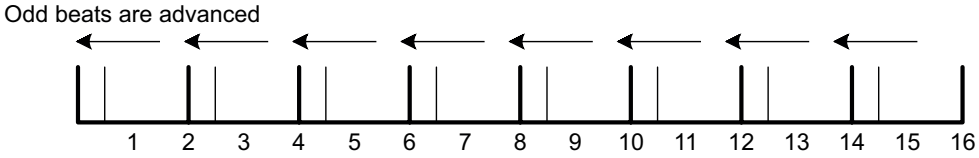
Swing

By default, all steps in a pattern are equally spaced in time. At tempo of 120 BPM, a 16-step pattern will repeat every 2 seconds, making the steps one-eighth of a second apart. Altering the Swing parameter from its default value of 50% (the range is 20% to 80%) alters the timing of odd-numbered steps (the off-beats); a lower swing value shortens the time between an odd beat and the previous even beat, a higher Swing value has the opposite effect.

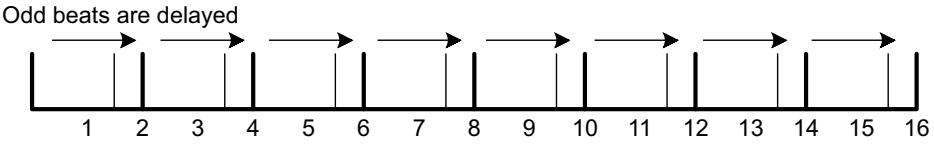
Swing is adjusted with the **Tempo** control [2] while pressing **Shift** [15]. The grid display changes to show the Swing percentage value in a similar manner to the tempo display.



Swing = 50%



Swing = 25%



Swing = 75%

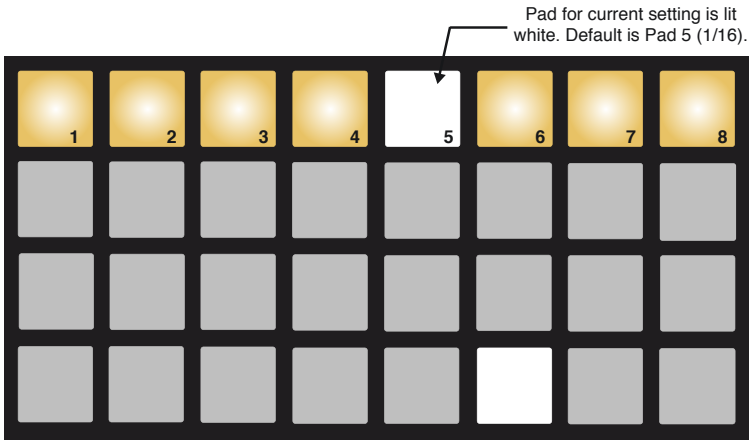
Swing can be used to add an extra "groove" to your pattern. Note that as it is the odd steps that are "swung", these can be interpreted as 1/16-notes (semiquavers).

Some particularly interesting rhythmic effects can be obtained by altering Swing with Patterns of odd-numbered lengths.

Swing sync

In addition to setting a Swing value manually with the **Tempo** control, it is also possible to set a global Swing Sync Rate. This acts as a “range” control, and defines the tempo interval by which the Swing parameter will shift alternate notes. The default value is a semiquaver, i.e., one Step (though in practice, a Swing of a whole tempo interval is not achievable due to the restricted range of the **Swing** control).

Press and hold **Shift** 15 and **Tap** 3 simultaneously to see ***Swing Sync View***.



Only the top row of pads are used: one pad will be illuminated white, indicating the currently selected Swing Sync Rate, according to the table below:

Pad	Sync Rate
1	1/4
2	1/4 T
3	1/8
4	1/8 T
5*	**1/16**
6	1/16 T
7	1/32
8	1/32 T

* Default value

Note that triplet intervals (denoted by ‘T’) are available as well as standard tempo intervals.

Automation of Knobs and Sliders

While a Pattern is playing you can, of course, tweak any of the synth controls to modify the sound. Circuit Mono Station features **Realtime Automation Recording**, which means you can add the effect of these tweaks to the recorded pattern by entering Record Mode (by pressing **Record** 11) while moving the knobs or sliders.

All the rotary and slider synth controls are automated in this way*, and a total of 53 automation 'lanes' are provided, each recording data for one synth parameter. Assignable controls such as **Coarse** and **Fine** Pitch are independently automated for Osc 1 and Osc 2. **Pulse Width** (**Shift** + **Fine**) is also automated for both Oscillators. The Modulation Matrix has 32 automation lanes allocated to it, as any movement of the **Depth** control is recorded along with its current source (one of four) and destination (one of eight) assignments.
However, note that none of the switches are automated: neither are the **Tempo**/**Swing** or **Volume** controls.

When you have entered Record Mode, the LEDs associated with the automated controls initially retain the colour and brightness they had previously, but as soon as you make an adjustment, the LED turns red to confirm that you are now recording the knob movement.

In order for the knob movements to be replayed, you must drop out of Record Mode before the sequence loops right round, otherwise Circuit Mono Station will overwrite the automation data with that corresponding to the new knob position. Provided you do this, you'll hear the effect of the control adjustment being replayed when the sequence next loops round, at the point in the pattern where you turned the control.

You can also record synth control changes when the sequence isn't playing; in ***Note View***, press **Record**, select the step at which the change should occur by pressing and holding the pad corresponding to the step; this will play the note(s) at that step. Then adjust the synth control(s) as required; the new value will be written to the automation data, and press **Record** again. When the sequence is running, you will hear the effect of the knob/slider movements at that step.

You can delete any Macro automation data you don't want to keep by holding down **Clear** and moving the knob in question by at least 20% of its rotation – the LED below the knob will turn red to confirm. But note this will clear the automation data for that Macro for the whole Pattern, not just at the sequencer's current step.

* Automation of rotary and slider controls is available in firmware versions v1.1 or later.

SYNTHESIS TUTORIAL

This section covers the general principles of electronic sound generation and processing in more detail, including references to Circuit Mono Station's facilities where relevant. It is recommended that this chapter is read carefully if analogue sound synthesis is an unfamiliar subject. Users familiar with this subject can skip this section and move on to the next.

To gain an understanding of how a synthesiser generates sound it is helpful to have an appreciation of the components that make up a sound, both musical and non-musical.

The only way that a sound may be detected is by air vibrating the eardrum in a regular, periodic manner. The brain interprets these vibrations (very accurately) into one of an infinite number of different types of sound.

Remarkably, any sound may be described in terms of just three properties, and all sounds always have them. They are:

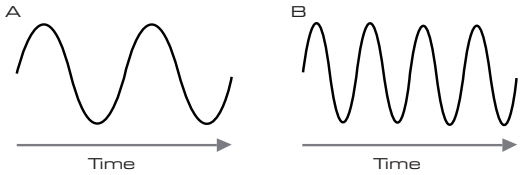
- Pitch
- Tone
- Volume

What makes one sound different from another is the relative magnitudes of the three properties as initially present in the sound, and how the properties change over the duration of the sound.

With a musical synthesiser, we deliberately set out to have precise control over these three properties and, in particular, how they can be changed during the "lifetime" of the sound. The properties are often given different names: Volume may be referred to as Amplitude, Loudness or Level, Pitch as Frequency and Tone as Timbre.

Pitch

As stated, sound is perceived by air vibrating the eardrum. The pitch of the sound is determined by how fast the vibrations are. For an adult human, the slowest vibration perceived as sound is about twenty times a second, which the brain interprets as a bass sound; the fastest is many thousands of times a second, which the brain interprets as a high treble sound.



If the number of peaks in the two waveforms (vibrations) are counted, it will be seen that there are exactly twice as many peaks in Wave B as in Wave A. (Wave B is actually an octave higher in pitch than Wave A.) It is the number of vibrations in a given period that determines the pitch of a sound. This is the reason that pitch is sometimes referred to as frequency. It is the number of waveform peaks counted during a given period of time which defines the pitch, or frequency.

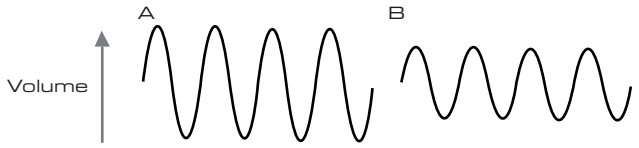
Tone

Musical sounds consist of several different, related pitches occurring simultaneously. The lowest is referred to as the ‘fundamental’ pitch and corresponds to the perceived note of the sound. Other pitches making up the sound which are related to the fundamental in simple mathematical ratios are called harmonics. The relative loudness of each harmonic as compared to the loudness of the fundamental determines the overall tone or ‘timbre’ of the sound.

Consider two instruments such as a harpsichord and a piano playing the same note on the keyboard and at equal volume. Despite having the same volume and pitch, the instruments still sound distinctly different. This is because the different note-making mechanisms of the two instruments generate different sets of harmonics; the harmonics present in a piano sound are different to those found in a harpsichord sound.

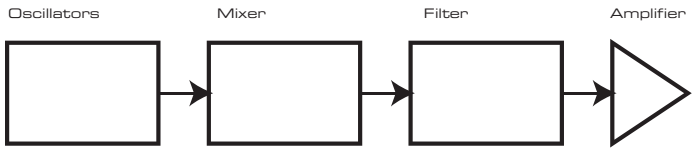
Volume

Volume, which is often referred to as the amplitude or loudness of the sound, is determined by how large the vibrations are. Very simply, listening to a piano from a metre away would sound louder than if it were fifty metres away.



Having shown that just three elements may define any sound, these elements now have to be realised in a musical synthesiser. It is logical that different sections of the synthesiser ‘synthesize’ (or create) each of these different elements.

One section of the synthesiser, the **Oscillators**, provide raw waveform signals which define the pitch of the sound along with its raw harmonic content (tone). These signals are then mixed together in a section called the **Mixer**, and the resulting mixture is then fed into a section called the Filter. This makes further alterations to the tone of the sound, by removing (filtering) or enhancing certain of the harmonics. Lastly, the filtered signal is fed into the **Amplifier**, which determines the final volume of the sound.



Additional synthesiser sections - **LFO**s and **Envelopes** - provide further ways of altering the pitch, tone and volume of a sound by interacting with the **Oscillators**, **Filter** and **Amplifier**,

providing changes in the character of the sound which can evolve over time. Because **LFO**s' and **Envelopes**' only purpose is to control (modulate) the other synthesiser sections, they are commonly known as 'modulators'.

These various synthesiser sections will now be covered in more detail.

The Oscillators And Mixer

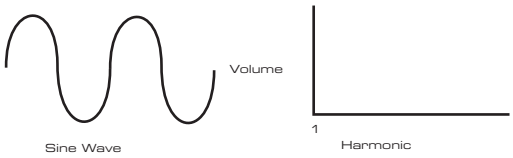
The Oscillator section is really the heartbeat of the synthesiser. It generates an electronic wave (which creates the vibrations when eventually fed to a loudspeaker). This waveform is produced at a controllable musical pitch, initially determined by the note played on the keyboard or contained in a received MIDI note message. The distinctive tone or timbre of the waveform is actually determined by the waveform's shape.

Many years ago, pioneers of musical synthesis discovered that just a few distinctive waveforms contained many of the most useful harmonics for making musical sounds. The names of these waves reflect their actual shape when viewed on an instrument called an oscilloscope, and they are: Sine waves, Square waves, Sawtooth waves, Triangle waves and Noise. Each of Circuit Mono Station's Oscillator sections can generate all these waveforms, and can generate non-traditional synth waveforms as well. (Note that Noise is actually generated independently and mixed in with the other waveforms in the Mixer section).

Each waveform (except Noise) has a specific set of musically-related harmonics which can be manipulated by further sections of the synthesiser.

The diagrams below show how these waveforms look on an oscilloscope, and illustrate the relative levels of their harmonics. Remember, it is the relative levels of the various harmonics present in a waveform which determine the tonal character of the final sound.

Sine Waves

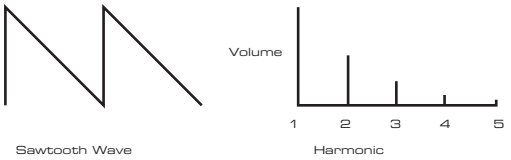


These possess just one harmonic. A sine waveform produces the "purest" sound because it only has this single pitch (frequency).

Triangle Waves

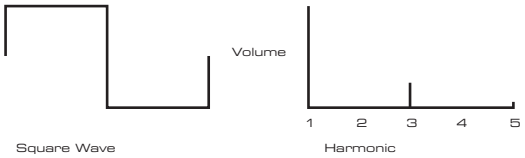
These contain only odd harmonics. The volume of each decreases as the square of its position in the harmonic series. For example, the 5th harmonic has a volume 1/25th of the volume of the fundamental.

Sawtooth Waves



These are rich in harmonics, and contain both even and odd harmonics of the fundamental frequency. The volume of each is inversely proportional to its position in the harmonic series.

Square / Pulse Waves

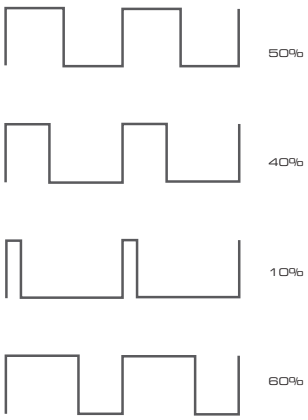


These contain only odd harmonics, which are at the same volume as the odd harmonics in a sawtooth wave.

It will be noticed that the square waveform spends an equal amount of time in its ‘high’ state as in its ‘low’ state. This ratio is known as the ‘duty cycle’. A square wave always has a duty cycle of 50% which means it is ‘high’ for half the cycle and ‘low’ for the other half. Circuit Mono Station lets you vary the duty cycle of the basic square waveform (via the Modulation Matrix) to produce a waveform which may be more ‘rectangular’ in shape for part of the note’s duration. Such waves are often known as Pulse waveforms. As the waveform becomes more and more rectangular, more even harmonics are introduced and the waveform changes its character, becoming more ‘nasal’ sounding.

If the width of the pulse waveform (the ‘Pulse Width’) is altered dynamically in the modulation matrix, the harmonic content of the waveform is made to constantly change. This can give the waveform a very ‘fat’ quality when the pulse width is altered at a moderate rate.

A pulse waveform sounds the same whether the duty cycle is – for example - 40% or 60%, since the waveform is just “inverted” and the harmonic content is exactly the same.

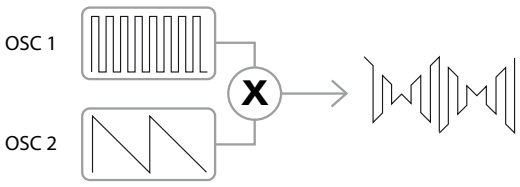


Noise

Noise is basically a random signal, and does not have a fundamental frequency (and therefore has no pitch property). Noise contains *all* frequencies, and all are at the same volume. Because it possesses no pitch, noise is often useful for creating sound effects and percussion type sounds.

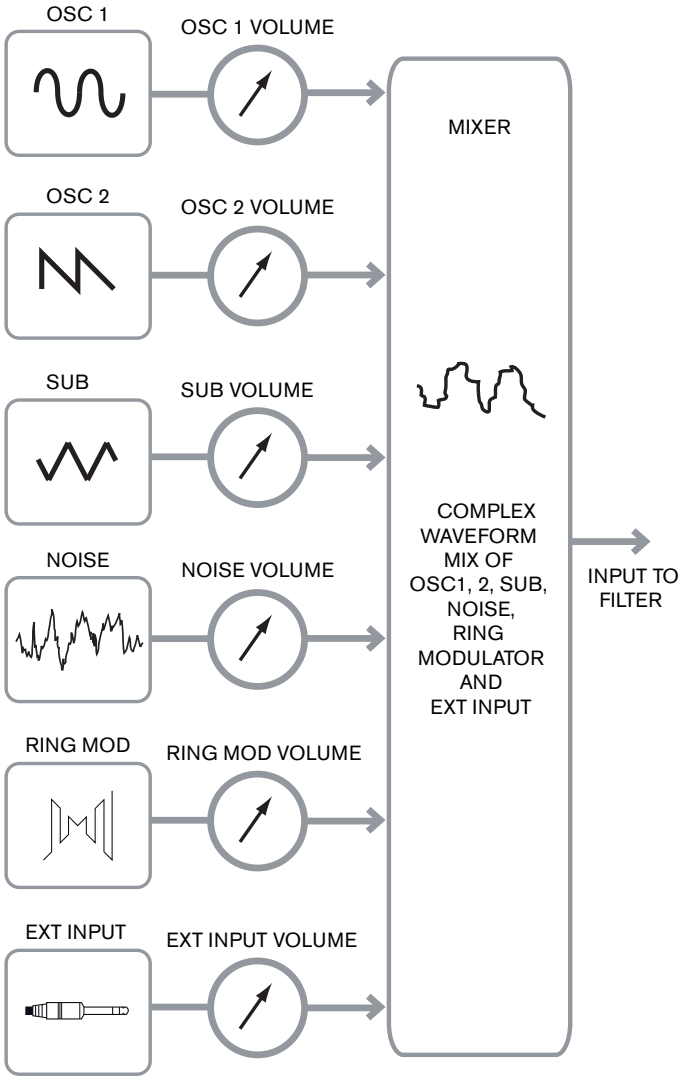
Ring Modulation

A Ring Modulator is a sound generator that takes signals from two oscillators and effectively “multiplies” them together. Circuit Mono Station’s Ring Modulator takes the waveforms from Oscillator 1 and Oscillator 2 as its inputs. The resulting output depends on the various frequencies and harmonic content present in each of the two oscillator signals, and will consist of a series of sum and difference frequencies as well as the frequencies present in the original signals.



The Mixer

To extend the range of sounds that may be produced, typical analogue synthesisers have more than one Oscillator (Circuit Mono Station has three, though only two have individual controls, the ‘sub’ Oscillator being fixed in frequency at two octaves below Oscillator 1’s frequency). By using multiple Oscillators to create a sound, it is possible to achieve very interesting harmonic mixes. It is also possible to slightly detune one Oscillator against the other, which creates a very warm, ‘fat’ sound. Circuit Mono Station’s Mixer allows you to create a sound consisting of the waveforms of Oscillators 1, 2 and the Sub Oscillator, a Noise source, the Ring Modulator output and an external audio input, all mixed together as required.



The Filter

The synth section of Circuit Mono Station is a *subtractive* music synthesiser. *Subtractive* implies that part of the sound is subtracted somewhere in the synthesis process.

The Oscillators provide the raw waveforms with plenty of harmonic content and the Filter section subtracts some of the harmonics in a controlled manner.

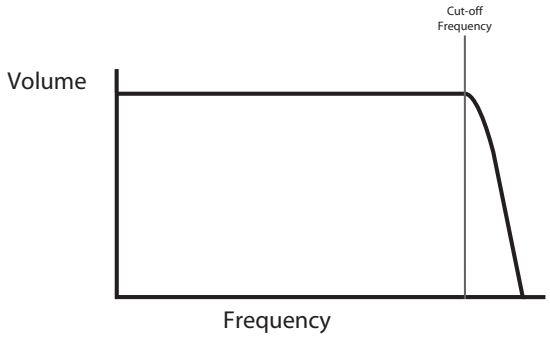
There are three basic filter types, all of which are available in Circuit Mono Station: low-pass, band-pass and high-pass. The type of filter most commonly used on synthesisers is low-pass. In a low-pass filter, a “cut-off frequency” is chosen and any frequencies below this are passed, while frequencies above are filtered out, or removed. The setting of the **Filter Frequency** parameter dictates the point above which frequencies are removed. This process of removing harmonics from the waveforms has the effect of changing the sound’s character or timbre. When the Frequency parameter is at maximum, the filter is completely “open” and no frequencies are removed from the raw Oscillator waveforms.

In practice, there is a gradual (rather than a sudden) reduction in the volume of the harmonics above the cut-off point of a low-pass filter. How rapidly these harmonics reduce in volume as frequency increases above the cut-off point is determined by the filter’s **Slope** parameter. The slope is measured in ‘volume units per octave’. Since volume is measured in decibels, this slope is usually quoted as so many decibels per octave (dB/oct). The higher the number, the greater the rejection of harmonics above the cut-off point, and the more pronounced the filtering effect. Circuit Mono Station’s filter section provides two slopes, 12 dB/oct and 24 dB/oct.

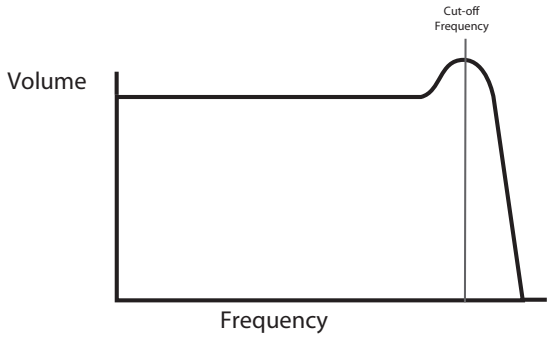
A further important parameter of the filter is Resonance. Frequencies at the cut-off point may be increased in volume by advancing the filter’s **Resonance** control. This is useful for emphasising certain harmonics of the sound.

As Resonance is increased, a whistling-like quality will be introduced to the sound passing through the filter. When set to very high levels, Resonance actually causes the filter to self-oscillate whenever a signal is being passed through it. The resulting whistling tone being produced is actually a pure sine wave, the pitch of which depends on the setting of the **Frequency** control (the filter’s cut-off point). This resonance-produced sine wave can actually be used for some sounds as an additional sound source if wished.

The diagram below shows the response of a typical low pass filter. Frequencies above the cut-off point are reduced in volume.

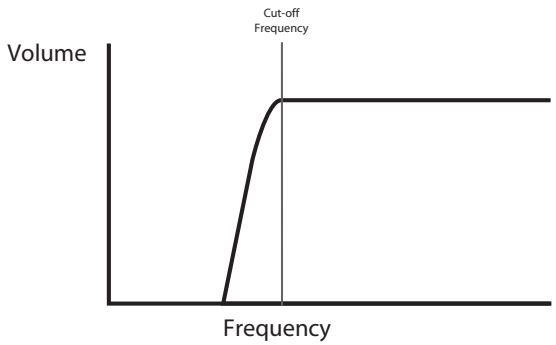


When resonance is added, the frequencies around the cut off point are boosted in volume.

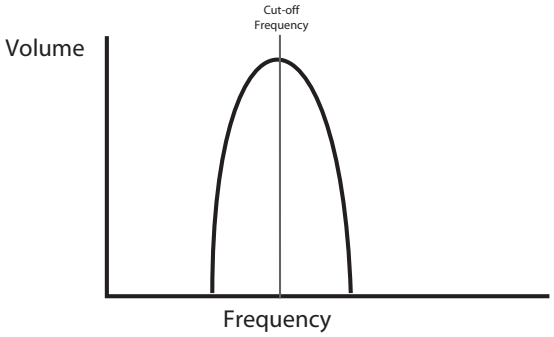


In addition to the traditional low-pass filter type, there are also high-pass and band-pass types. On Circuit Mono Station, the Filter type is selected with the **Shape** switch 30.

A high-pass filter is similar to a low-pass filter, but works in the “opposite sense”, so that it is frequencies *below* the cut-off point which are removed. Frequencies above the cut-off point are passed. When the Filter **Frequency** parameter is set to minimum, the filter is completely open and no frequencies are removed from the raw Oscillator waveforms.



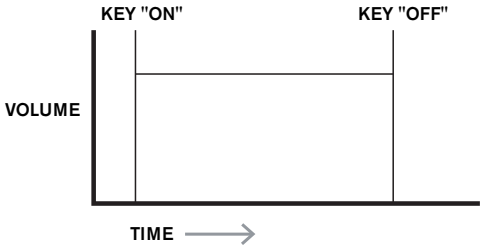
With a band-pass filter, just a narrow band of frequencies centered around the cut-off point is passed. Frequencies above and below the band are removed. It is not possible to fully open this type of filter and allow all frequencies to pass.



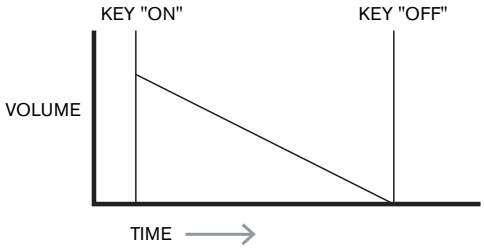
Envelopes And Amplifier

In earlier paragraphs, the synthesis of the pitch and the timbre of a sound was described. The next part of the Synthesis Tutorial describes how the volume of the sound is controlled. The volume of a note created by a musical instrument often varies greatly over the duration of the note, according to the type of instrument.

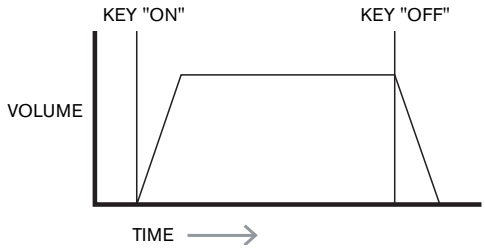
For example, a note played on an organ quickly attains full volume when a key is pressed. It stays at full volume until the key is released, at which point the volume level falls instantly to zero.



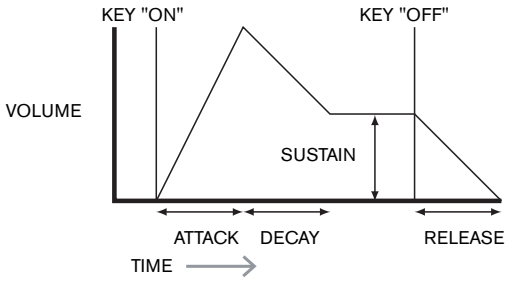
A piano note quickly attains full volume after a key is pressed, but gradually falls in volume to zero after several seconds, even if the key is held.



A string section emulation only attains full volume gradually when a key is pressed. It remains at full volume while the key is held down, but once the key is released, the volume falls to zero fairly slowly.



In an analogue synthesiser, changes to a sound's character which occur over the duration of a note are controlled by a section called an Envelope Generator. One (**Amp Env**) is always related to the Amplifier, which controls the note's amplitude – i.e., the volume of the sound - when the note is played. Each envelope generator has four main parameters, which determine the shape of the envelope; these are often referred to as the ADSR parameters.



Attack Time
Adjusts the time it takes after a key is pressed for the volume to climb from zero to full volume. It can be used to create a sound with a slow fade-in.

Decay Time
Adjusts the time it takes for the volume to fall from its initial full volume to the level set by the Sustain control while a key is held down.

Sustain Level
This is unlike the other Envelope controls in that it sets a level rather than a period of time. It sets the volume level that the envelope remains at while the key is held down, after the Decay Time has expired.

Release Time
Adjusts the time it takes for the volume to fall from the Sustain level to zero once the key is released. It can be used to create sounds that have a “fade-out” quality.

Circuit Mono Station has a single Envelope Generator for controlling signal amplitude. It has a dedicated set of ADSR controls, and is always applied to the amplifier to shape the volume of each note played, as detailed above. Some synthesisers can generate multiple envelopes, for example one or more Modulation Envelopes. Modulation envelopes can be used to dynamically alter other sections of the synthesiser during the lifetime of each note. For example, they can be used to modify the filter cut-off frequency, or the pulse width of the Oscillators’ Square Wave outputs, for example.

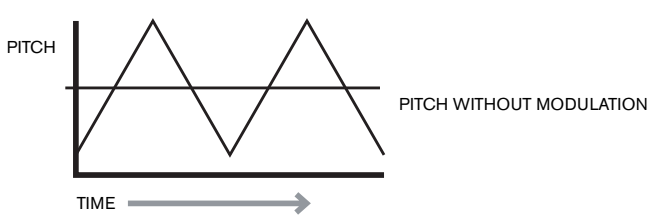
LFOs
Like the Envelope Generators, the LFO (Low Frequency Oscillator) section of a synthesiser is a Modulator. Thus instead of being a part of the sound synthesis itself, it is used to change (or modulate) other sections of the synthesiser. In Circuit Mono Station, for example, the LFO can be used to alter Oscillator pitch, or Filter cutoff frequency, among other parameters.

Most musical instruments produce sounds that vary over time both in volume and in pitch and timbre. Sometimes these variations can be quite subtle, but still contribute greatly towards characterising the final sound.

Whereas an Envelope is used to control a one-off modulation over the lifetime of a single note, LFOs modulate by using a repeating cyclic waveform or pattern. As discussed earlier, Oscillators produce a constant waveform, which can take the shape of a repeating sine wave, triangle wave etc. LFOs produce waveforms in a similar way, but normally at a frequency which is too low to produce a sound that the human ear could perceive directly. As with an Envelope, the waveforms generated by the LFOs may be fed to other parts of the synthesiser to create the desired changes over time – or ‘movements’ - to the sound.

Imagine this very low frequency wave being applied to an Oscillator’s pitch. The result is that the pitch of the Oscillator slowly rises and falls above and below its original pitch. This would simulate, for example, a violinist moving a finger up and down the string of the instrument whilst it is being bowed. This subtle up and down movement of pitch is referred to as the ‘Vibrato’ effect.

A waveshape often used for an LFO is a Triangle wave.



Alternatively, if the same LFO signal were to modulate the Filter cut-off frequency instead of the Oscillator pitch, a familiar wobbling effect known as ‘wah-wah’ would be the result.

Summary

A synthesiser can be broken down into five main sound generating or sound modifying (modulating) blocks:

1. Oscillators that generate waveforms at a various pitches.
2. A Mixer that mixes the outputs from the Oscillators together (and add Noise and other signals).
3. Filters that remove certain harmonics, changing the character or timbre of the sound.
4. An Amplifier controlled by an Envelope generator, which alters the volume of a sound over time when a note is played.
5. LFOs and Envelopes that can be used to modulate any of the above.

Much of the enjoyment to be had with a synthesiser is with experimenting with the factory preset sounds (Patches) and creating new ones. There is no substitute for ‘hands on‘ experience. Experiments with adjusting Circuit Mono Station’s various controls will eventually lead to a fuller understanding of how the various synth sections alter and help shape new sounds. Armed with the knowledge in this chapter, and an understanding of what is actually happening in the synth when tweaks to the knobs and switches are made, the process of creating new and exciting sounds will become easy. Have fun!

CIRCUIT MONO STATION – SYNTHESISER SECTION

Sound modification

Once you have loaded a Patch you like the sound of, you can modify the sound in many different ways using the synth controls. The various individual synth controls are dealt with in greater depth a bit further on, but a few points should be discussed here:

LED parameter indicators

All the “analogue” controls in the synth section – that is, the knobs and sliders – have an associated “null” LED. (The mixer controls are slightly different in that the LED illumination is internal to the pot shaft.) These LEDs illuminate with a brightness proportional to the current parameter level set by the control or, when a synth Patch is loaded, the levels of the parameter saved in the Patch.

“Pot pickup” on Circuit Mono Station is set Off at the factory*. See page 86 for details of how to select it. Note that the setting of Pot Pickup is saved at power-down, so if you prefer to have it On, it will remain On.

- With Pot Pickup off, a control will “take over” from the saved Patch parameter value when moved, and the value will then be determined by the knob position in the conventional manner. In this mode, there will be a sudden change in parameter value (and hence in sound) when the pot is moved.
- With Pot Pickup on, a control needs to be moved to the physical position corresponding to the Patch’s saved parameter value before the control becomes active. In this mode, the control remains inactive until the “null” point is reached, thus avoiding any sudden jump in parameter level.

* Pot Pickup is available in firmware versions v1.1 or later.

The Filter knob

Adjusting the frequency of the synth’s filter is one of the most common methods of sound modification. For this reason, Filter **Frequency** is controlled by a large rotary control 32 just above the grid section. Experiment with different types of patch to hear how changing the filter frequency alters the characteristic of different types of sound.

Pitch and Mod wheels

Pitch and Mod wheels on external keyboards are not supported by Circuit Mono Station.

External control

Circuit Mono Station has a high degree of MIDI implementation, and most unit functions and synth parameters transmit MIDI data to external equipment by default. Similarly, Circuit Mono Station can be controlled in most respects by incoming MIDI data from a DAW or sequencer, though external MIDI control must first be enabled.

MIDI settings, including transmit/receive and channel selection, are controlled from the ***System Settings View***. See “System Settings” on page 86 for full details.

In addition to being able to transmit MIDI data, Circuit Mono Station is also equipped with standard **CV + GATE** outputs which can send analogue note data to other compatible equipment. The CV and GATE outputs are separate 3.5 mm jack sockets on the rear panel.

Note data is always present when a Pattern is playing, and the CV output will transmit the pitch values of Oscillator 1. This means you can control the pitch of an external synth (e.g., Eurorack module) with the **Osc 1 Range**, **Coarse** and **Fine** controls. The **CV** output is scaled at 1 V/octave and covers a range from 0 V to +7 V: MIDI Note #24 (C1) = 0 V; MIDI Note #36 (C2) = +1 V, and so on. Linear scaling applies within octaves for the other notes.

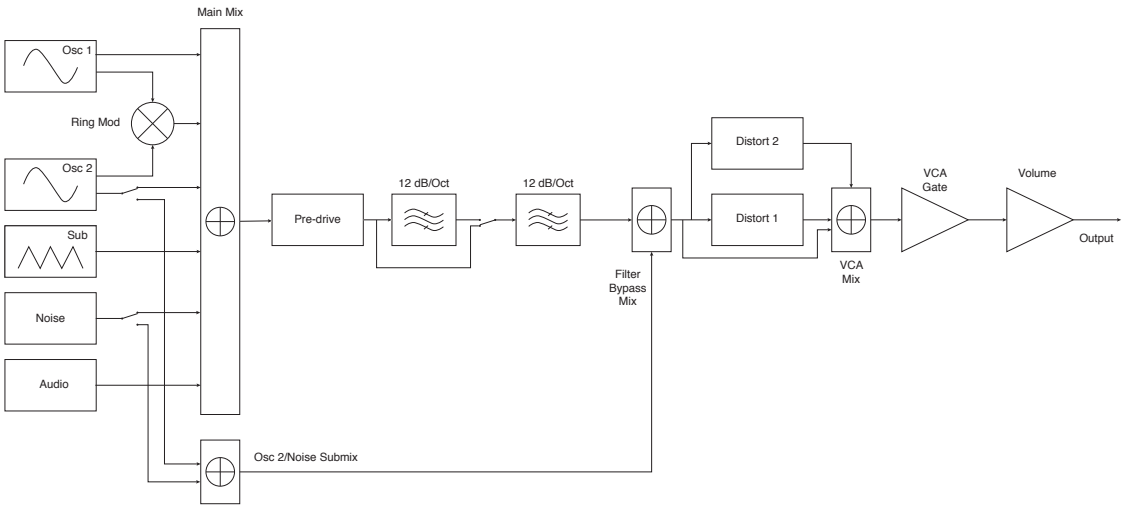
The **GATE** output is a per-note pulse of +5 V amplitude, with a duration equal to the length of the note and a rise time of 140 - 170 µs. The GATE pulse is output fractionally later than the CV voltage to permit external equipment to stabilise its pitch before the note is turned on.

Circuit Mono Station also has an **AUX CV** output (7), for connection to external synth modules. **AUX CV** is one of the eight destinations of the Modulation Matrix (see page 82), and you can assign any of the Matrix sources to it. The voltage range is -5 V to +5 V. Be aware of the necessity to carefully adjust the **Depth** control [40] if using multiple modulation sources, as the matrix's additive nature may introduce clipping.

Analogue **CLOCK IN** and **CLOCK OUT** connectors are also provided on Circuit Mono Station. See "Analogue Clock Rates" on page 87 for full details.

Synthesiser Block Diagram

Each section of the synthesiser is now discussed in detail: the diagram below indicates the general signal flow through the various processing elements.



The Oscillator section

Circuit Mono Station's Oscillator section consists of two identical primary oscillators, plus a "sub-octave" oscillator which is always frequency-locked to Oscillator 1. The primary oscillators, Osc 1 and Osc 2, share a single set of controls; the oscillator being controlled is selected by the **Osc 1** and **Osc 2** buttons 5. After adjustments have been made to one oscillator, the other may be selected and the same controls used to adjust its contribution to the overall sound, without altering the settings of the first. You can constantly reassign the controls between the two oscillators until you get the sound you're after.

The following descriptions thus apply equally to the two oscillators, depending which is currently selected:

Waveform
The **Wave** button 17 selects one of four fundamental wave shapes - ∿ Sine, ∧ Triangle, ◿ (rising) Sawtooth or ⊓ Square/Pulse. The LEDs above the switch confirm the waveform currently selected.

Pitch
The three controls **Range** 16, **Coarse** 18 and **Fine** 19 set the Oscillator's fundamental frequency (or Pitch). The **Range** switch is calibrated in traditional "organ-stop" units, where 16' gives the lowest frequencies and 2' the highest. Each doubling of stop length halves the frequency and thus shifts the pitch down one octave. When **Range** is set to 8', the grid "keyboard" will be at concert pitch with Middle C on the lower, left-most pad in normal ***Note View***.

The **Coarse** and **Fine** rotary controls adjust the oscillator pitch over a range of ±1 octave and ±1 semitone respectively.

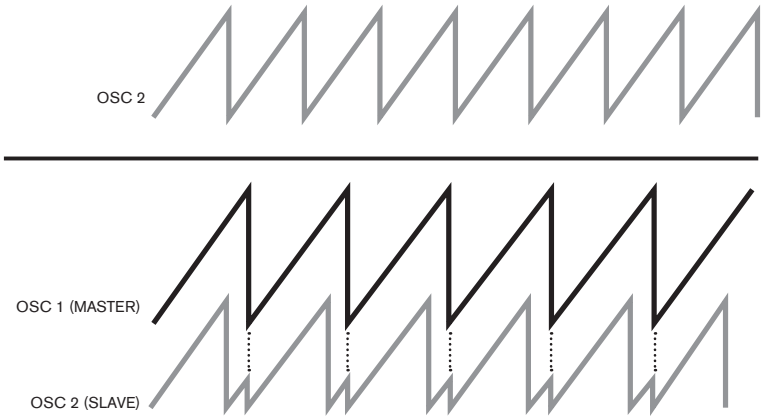
Pulse Width
When the Oscillator waveform is set to Square/Pulse, the timbre of the "edgy" square wave sound can be modified by varying the pulse width, or duty cycle, of the waveform.

When a Square/Pulse wave is selected, the duty cycle (pulse width) of the waveform can be varied manually by holding down the **Shift** button 15 and adjusting the Oscillator **Fine** control 19. Extreme clockwise and anticlockwise settings produce very narrow positive or negative pulses, with the sound becoming thinner and more "reedy" as the control is advanced.

Pulse width may also be modulated automatically by various synth sources within the Modulation Matrix: see page 82.

Oscillator Sync

Oscillator Sync is a commonly used technique of sound modification which you are likely to be familiar with if you are already a synth user. On Circuit Mono Station, Oscillator Sync is enabled by pressing **Osc 2** 5 while holding **Shift** 15 down. Oscillator Sync is a technique of using one oscillator (Osc 1 on Circuit Mono Station) to add additional harmonics to the waveform produced another (Osc 2), by making the waveform from Osc 1 "retrigger" that of Osc 2 before a full cycle of Osc 2's waveform has been completed. This produces an interesting range of sonic effects, the nature of which varies as the frequency of Osc 1 is altered, and is also dependent on the ratio of the two oscillators' frequencies, as the additional harmonics may or may not be musically related to the fundamental frequency. The diagrams below illustrate the process.



In general, it is advisable to turn down the volume of Osc 1 in the Mixer so that you don't hear its effect.

The Sub Oscillator

In addition to the two primary oscillators, Circuit Mono Station has a secondary "sub-octave" oscillator, whose output can be added to that of Osc 1 and Osc 2 to a greater bass effect. The sub oscillator's frequency is always locked to that of Osc 1, so that its pitch is exactly one octave below it. The waveform of the sub oscillator is always a triangle wave.

The sub oscillator has no independent controls. Its output is fed to the Mixer Section where it may be added to the synth sound to the degree required.

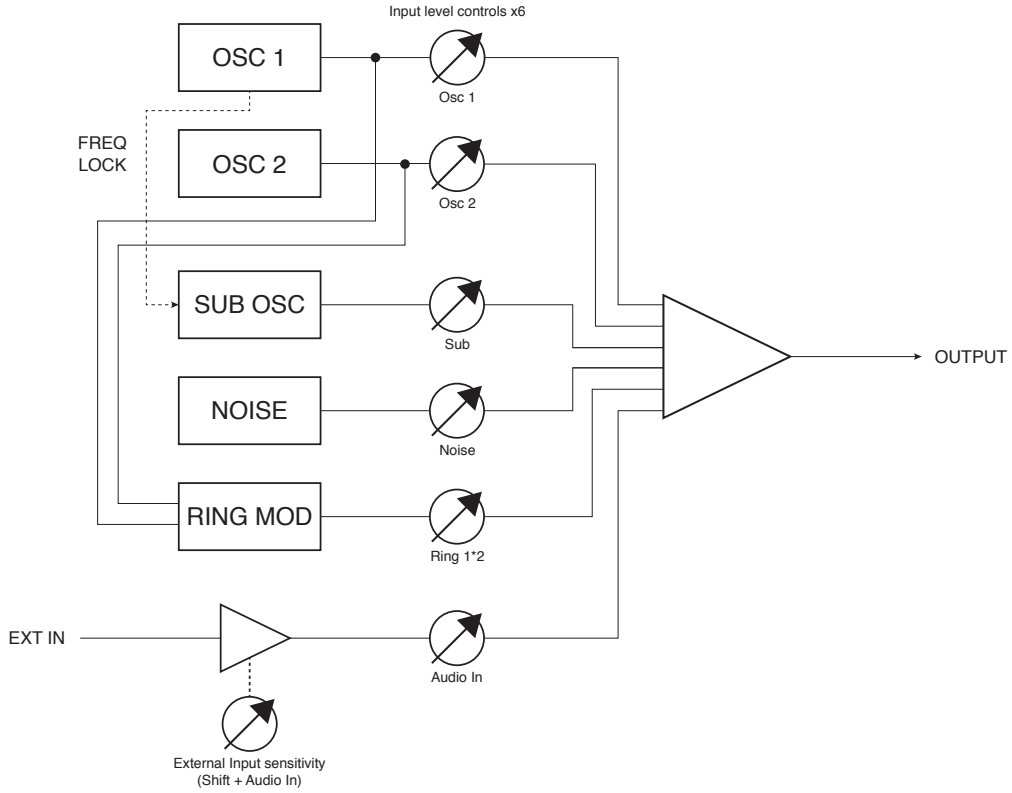
Noise

Circuit Mono Station also has a noise generator. Noise is a signal comprising a wide range of frequencies, and is a familiar "hissing" sound which can be used to create percussive sounds among other effects. The noise generator has its own input to the mixer, and in order to hear it in isolation, its input will need to be turned up and the other oscillator inputs turned down. (See "The Mixer section" on page 75.)

The Ring Modulator

The Ring Modulator takes the waveforms from Oscillator1 and Oscillator 2 as its inputs and typically generates a complex output waveform comprising the Oscillator frequencies, their sum and difference frequencies, plus numerous other harmonics whose range will depend on the shape and frequencies of the inputs. Setting the frequencies of the two Oscillators to be near-multiples of each other produces some interesting low-frequency "beating" effects.

The Mixer section



The outputs of the various sound sources can be mixed together in various proportions to produce the overall synth sound, using what is essentially a simple 6-into-1 mono mixer.

Each of the six sound sources has its own level control (23 to 28). The control shafts have internal LED illumination: Osc 1 and Osc 2 follow the colour convention used throughout Circuit Mono Station while the other four are orange. The intensity of the illumination reflects the level of the input in each case.

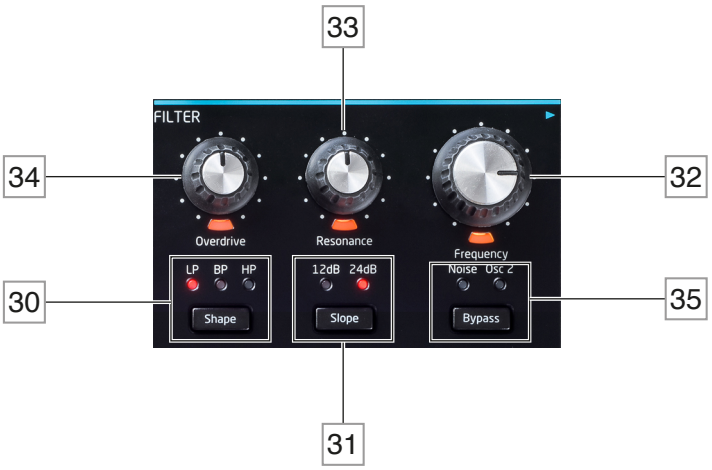
External Input
The Mixer section has an external audio input. You can connect another audio source here - for example, the output from another synth module - and use Circuit Mono Station's envelope, filter and mod sections to treat it. You can even connect the output of Circuit Mono Station to itself: this "recursive" connection can produce some extreme and startling effects!

The external input is a standard ¼" jack socket (2) on the rear panel.

The **Audio In** control adjusts the level of the external input in the mix. You can also adjust the gain (or sensitivity) of the input stage by holding down **Shift** [15] and adjusting the same control: this will allow Circuit Mono Station to accept a wide range of signal levels. Note that although all the Mixer level controls are automated (see "Automation of Knobs and Sliders" on page 58), the shifted Gain function of Audio In is not automated.

> You can use the External Input to configure Circuit Mono Station as a filter/ distortion effects unit. Program an Osc 1 Pattern with a single note on Step 1 which sounds for the whole bar (16 Pattern steps) – this will keep the envelope open. Turn all Oscillator level controls down in the mixer. The signal applied at the External Input can now be treated by the Filter and Distortion sections.

The Filter section

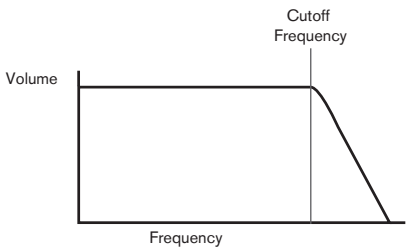


The sum created in the mixer from the various signal sources is fed to the Filter Section. Circuit Mono Station's filter section is both simple and traditional, and can be configured with only a small number of single-function controls.

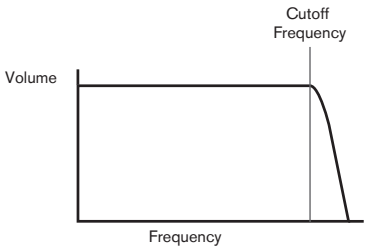
By default, the Filter Section affects all the signals fed to the Mixer Section. An unusual feature in Circuit Mono Station is that you can choose not to apply the filter to Oscillator 2 and/or the Noise signal with the **Bypass** button [35]. Successive presses of Bypass switch the filter out of circuit for the Noise source, Oscillator 2's waveform, or both of these, in turn. The sources being bypassed are indicated by the two LEDs above the button. A further press cancels the bypass function and returns the filter to affecting all sources.

Filter Shape

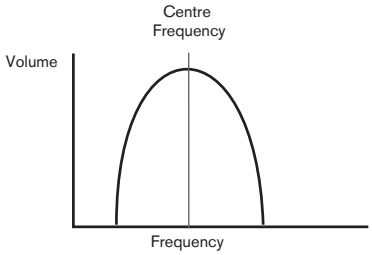
The filter may be configured to have a low-pass (**LP**), band-pass (**BP**) or hi-pass (**HP**) characteristic with the **Shape** button 30. The **Slope** button 31 sets the degree of rejection applied to out-of-band frequencies; the **24 dB** position gives a steeper slope than the **12 dB**; an out-of-band frequency will be attenuated more severely with the steeper setting.



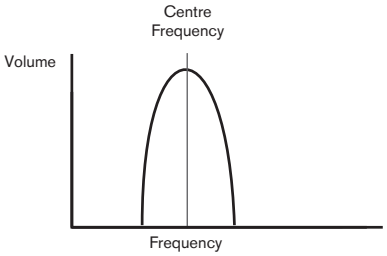
Low Pass 12 dB



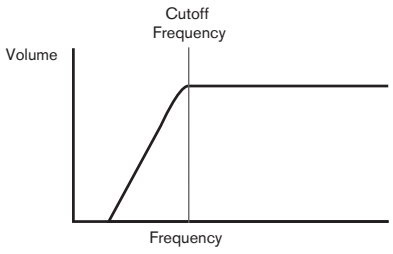
Low Pass 24 dB



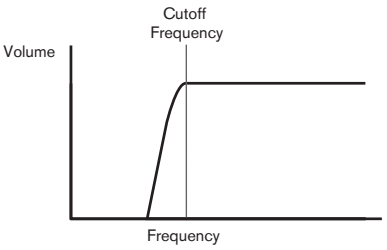
Band Pass 12 dB



Band Pass 24 dB



High Pass 12 dB



High Pass 24 dB

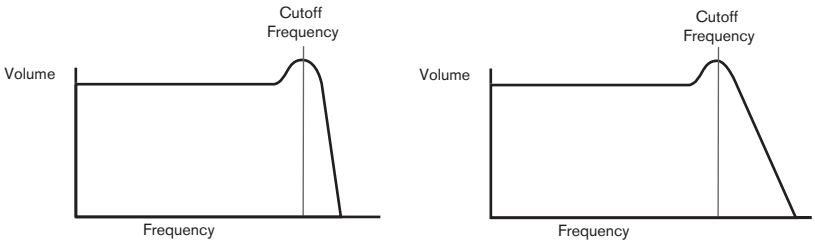
Frequency

The large rotary **Frequency** control 32 sets the filter cut-off frequency when **Shape** is set to **HP** or **LP**. With a band-pass filter configured, **Frequency** sets the centre frequency of the pass-band.

Sweeping the filter frequency manually will impose a “hard-to-soft” characteristic on almost any sound.

Resonance

The **Resonance** control 33 adds gain to the signal in a narrow band of frequencies around the frequency set by the **Frequency** control. It can accentuate the swept-filter effect considerably. Increasing the resonance parameter is very good for enhancing modulation of the cut-off frequency, creating a very edgy sound. Increasing **Resonance** also accentuates the action of the **Frequency** control, giving it a more pronounced effect. At high settings, it can induce self-oscillation within the filter section, adding a characteristic whistling effect to the sound.

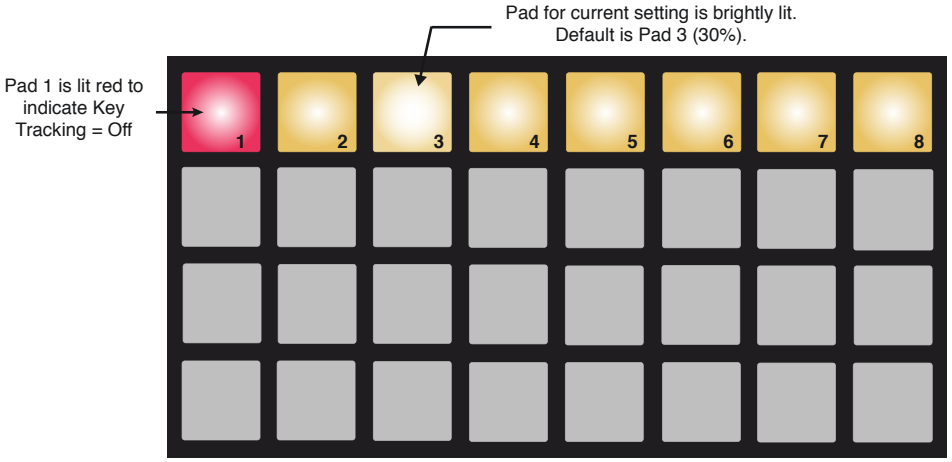


Low Pass 24 dB with Resonance

Low Pass 12 dB with Resonance

Filter Key Tracking

The cut-off frequency of the filter can be made to “track” the pitch of the note being played. This is controlled from ***Key Tracking View***, which is opened by pressing **Shift** 15 and **Osc 1** 5 together. The pad grid looks like this:



Only the top row of the grid is active in this View. Press one of Pads 1 to 8 to select the degree of Filter Key tracking required, according to the table:

Pad	Value
1	0% (Key Tracking Off)
2	15%
3	30%
4	45%
5	60%
6	75%
7	90%
8	100%

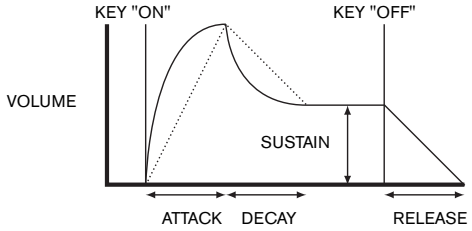
At the maximum value (100%), the filter frequency moves in semitone steps with the notes – i.e., the filter tracks the pitch changes in a 1:1 ratio (e.g., when playing two notes an octave apart, the filter cut off frequency will also change by one octave). When set Off, the filter frequency remains constant, whatever note(s) are played.

Overdrive

The filter section includes a dedicated drive (or distortion) generator; the Overdrive control 34 adjusts the degree of distortion treatment applied to the signal. The drive is added before the filter.

The Envelope section

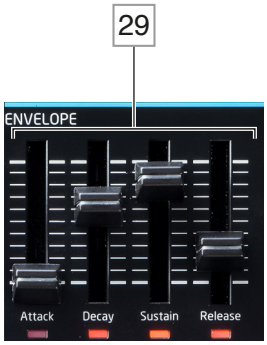
Circuit Mono Station generates an envelope each time a note is played, which can be used to modify the synth sound in various ways. The envelope controls are based on the familiar ADSR concept.



The ADSR envelope can be most easily visualised by considering the amplitude (volume) of a note over time. The envelope describing the “lifetime” of a note can be split into four distinct phases:

- **Attack** – the time it takes for the note to increase from zero (e.g., when the note is triggered) to its maximum level. A long attack time produces a “fade-in” effect.
- **Decay** – the time it takes for the note to drop in level from the maximum value reached at the end of the attack phase to a new level, defined by the Sustain parameter.
- **Sustain** – this is an amplitude value, and represents the volume of the note after the initial attack and decay phases – i.e., while a pad is still being pressed if playing in real time. Setting a low value of Sustain can give a very short, percussive effect (providing the attack and decay times are short).
- **Release** – This is the time it takes for the note’s volume to drop back to zero after the pad is released. A high value of Release will cause the sound to remain audible (though diminishing in volume) after the pad is released.

Although the above discusses ADSR in terms of volume – that is, *Modulation of Amplitude*, note that Circuit Mono Station lets you use the Envelope to modulate several other synth parameters as well, using the Modulation Matrix. This is discussed in more detail at page 82.



Circuit Mono Station has a dedicated slider control 29 for each ADSR parameter:

- **Attack** – sets the note's attack time. With the slider at its lowest position, the note attains its maximum level immediately a note is triggered; with the slider in its uppermost position, the note takes over 5 seconds to reach its maximum level. Midway, the time is approx. 250 ms.
- **Decay** – sets the time the note takes to decay from its initial level to that defined by the Sustain parameter. With the slider at the mid-position, the time is approx. 150 ms.
- **Sustain** – sets the volume of the note after the decay phase. A low Sustain value will obviously have the effect of emphasising the start of the note; having the slider fully down will make the note inaudible when the decay time has elapsed.
- **Release** – Many sounds acquire some of their character from the notes remaining audible after the pad is released; this "hanging" or "fade-out" effect, with the note gently dying away naturally (as with many real instruments) can be very effective. With the slider set to the mid-position the Release Time will be approx. 360 ms. Circuit Mono Station has a maximum release time of over 10 seconds, but shorter times will probably be more useful! The relationship between the parameter value and the Release Time is not linear.

You will find that the various factory Patches use many different Modulation Matrix routings. Many of them – including Init Patch – route the Envelope to the VCA (**Amp**) so that the ADSR sliders operate in a "conventional" manner, but some do not have this routing, and you may find the ADSR controls do not affect the sound at all.

The LFO section

Circuit Mono Station has a Low Frequency Oscillator (LFO) whose output may be routed to various parts of the synth using the Modulation Matrix (see page 82). With fairly slow settings of **Rate**, it can typically be used to modulate oscillator frequency to give a vibrato effect or amplitude for a tremolo effect. It can also be used to great effect to modulate filter frequency

LFO Waveforms

The **Wave** button 21 select one of four wave shapes - Triangle, (falling) Sawtooth, Square or Sample and Hold. The LEDs next to the switch confirm the waveform currently selected.

LFO Rate

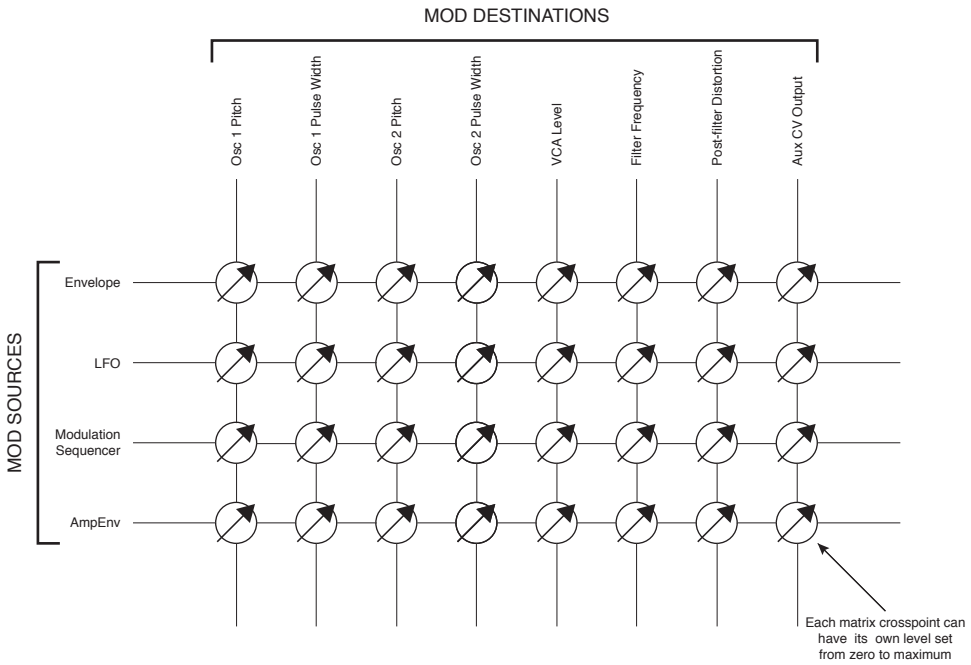
The speed (or frequency) of the LFO is set by the **Rate** control 20. The frequency range is from zero to about 200 Hz.

LFO Sync

The LFO frequency may be synchronised to the master tempo clock to produce LFO effects that are musically related to the Pattern timing. Selecting **Sync** 22 reassigns the function of the **Rate** control, and allows the frequency of the LFO to be locked to subdivision of the internal or external MIDI clock, based on a Sync Rate value selected by the **Rate** control. See Sync Values table on page page 48 for a list of available Sync Rates.

The Modulation Matrix

The key to versatility in a synthesiser lies in the ability to interconnect the various controllers, sound generators and processing blocks such that one block is controlling – or “modulating” - another, in as many ways as possible. Circuit Mono Station provides considerable flexibility of control routing in the form of the Modulation Matrix Section. The available modulating sources and the destinations to be modulated can be thought of as the inputs and outputs of a matrix:



The Modulation Matrix may be visualised as a system for connecting controlling sources to a specific area of the synth. The matrix has four sources and eight destinations and thus has 32 crosspoints. The matrix is *variable*.

What do we mean by a ‘variable’ matrix?
We mean that it is not just the routing of a controlling source to a controlled parameter which is defined in each slot, but also the “magnitude” of the control. Thus the ‘amount’ of control – or Depth – used is up to you.

You need to be careful when setting up matrix routings to ensure that the combined effect of all the controllers acting simultaneously still creates the sound that you want.

Matrix assignment

The Modulation Matrix supports up to four modulating sources to be routed simultaneously to up to eight controlled destinations. This implies 32 possible assignments, each with a different level or “amount” of control.

The four modulating sources available are:

- **Env** – the output of the envelope generator
- **LFO** – the LFO output
- **Seq** – the modulation sequence
- **Vel** – velocity

The eight destinations available for control are:

- **Pitch** – Oscillator 1 Pitch
- **Pitch** – Oscillator 2 Pitch[1]
- **PWM** – Oscillator 1 Pulse Width[2]
- **PWM** – Oscillator 2 Pulse Width[1,2]
- **Amp** – VCA level
- **Filter** – filter frequency
- **Dist** – post-filter distortion amount
- **Aux CV** –DC voltage at the AUX CV output

NOTES:

1. **Pitch** and **PWM** are active for the Oscillator currently selected by Osc 1 and Osc 2 buttons 5.
2. Oscillator waveform must be set to Square/Pulse for **PWM** to be active.

The **Depth** control 40 determines the degree of control that the selected source has over the selected destination. It is a “soft” control, in that it sets the control level for the particular matrix routing currently defined by the settings of the **Source** 38 and **Destination** 39 buttons. Each of the 32 possible routings can have its own level. The currently selected Source is indicated by the LEDs above the button and the currently selected Destination by the LED in the Destination buttons – only one LED will be lit in each case. The LEDs in the **Pitch** and **PWM** buttons will light in the currently selected Oscillator’s characteristic colour.

The **Depth** control’s LED illuminates at a brightness proportional to the control level for the currently selected matrix routing.

Depth effectively defines the “amount” by which the controlled parameter varies when under modulation control. Think of it as the “range” of control. Depth is also “bi-polar” and thus determines the polarity of the control – positive values will increase the value of the controlled parameter and negative values will decrease it, for the same control input. Note that having defined source and destination in a matrix routing, no modulation will occur until the Depth control is set to something other than zero.

There is one important exception to the above:
When **Env** is routed to **Amp**, the Depth control operates as an on/off switch: the envelope either controls the VCA level or it doesn’t.

Negative values of Depth do not work on certain parameters.

The LFO is a bi-polar Source. This means that when **LFO** is selected as a Source, the destination parameter(s) will swing both above and below its unmodulated value.

This is most easily visualised when the LFO is routed to modulate the Pitch of an Oscillator: with **Depth** at zero, the Oscillator will sound at its normal pitch, but as Depth is increased positively, the pitch will rise above and then fall below the normal frequency. The effect of positive and negative values of **Depth** can then be best appreciated if LFO is set to an asymmetrical wave shape such as sawtooth.

Adding LFO Modulation can add a pleasing vibrato when a sine or triangle LFO waveform is used, and the LFO speed is set neither too high nor too low. A sawtooth or square LFO waveform will produce rather more dramatic and unusual effects.

Adding envelope modulation can give some interesting effects, with the oscillator pitch altering over the duration of the note as it is played.

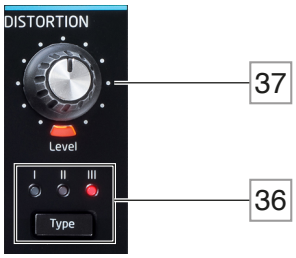
The sonic effect of LFO modulation on pulse width is very dependent on the LFO waveform and speed used, while using envelope modulation can produce some good tonal effects, with the harmonic content of the note changing over its duration.

Modulating Filter frequency with the LFO can produce some unusual “wah-wah” type effects. Setting the LFO to a very slow speed can add a gradual hardening and then softening edge to the sound.

When Filter frequency is modulated by the Envelope, the filter action changes over the duration of the note. By adjusting the Envelope controls carefully, this can produce some very pleasing sounds, as for example, the spectral content of the sound can be made to differ considerably during the attack phase of the note compared to its “fade-out.

The Distortion section

Distortion is applied separately after the Filter section. There are only two controls: **Type** and **Level**.



The **Type** button 36 selects one of three analogue distortion types, simply referred to as **I**, **II** and **III**:

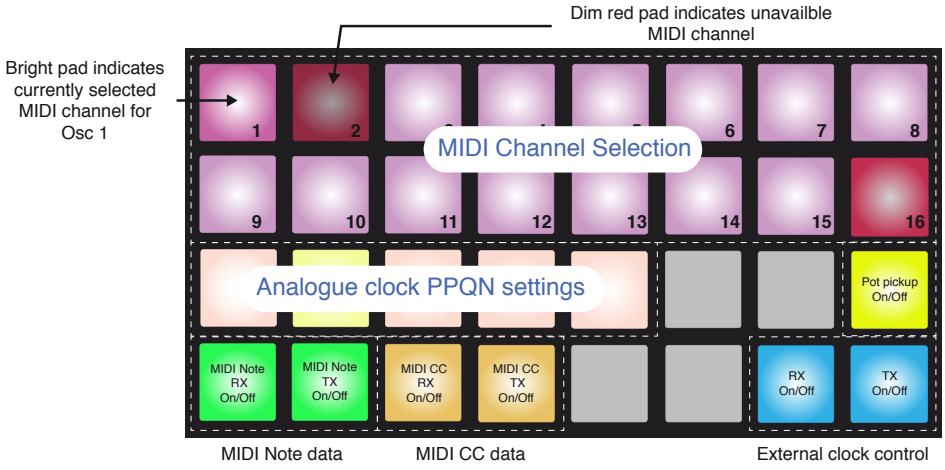
- Type **I** uses the distortion circuitry found on the Novation Bass Station II synth
- Type **II**: classic fuzz distortion
- Type **III**: a combination of types I and II

The **Level** control adjusts how much distortion is applied to the post-Filter signal.

SYSTEM SETTINGS

Global settings for Circuit Mono Station are made using ***System Settings View***. This lets you configure MIDI operation and set MIDI channels, enable Pot Pickup and set the analogue clock output rate.

System Settings View can only be opened at power-up: press hold **Shift** 15 down while pressing the **Power** button to open the View. The View changes (re colours) according to whether Oscillator 1 or Oscillator 2 is selected: the graphic below shows that for Osc 1.



System Settings View is exited by pressing the (Play) button.

MIDI I/O

You can choose to transmit and/or receive MIDI Note data, MIDI CC (Control Change) data and MIDI clock independently. When Circuit Mono Station is shipped from the factory, it is set to transmit AND receive all three classes of MIDI information. This flexibility allows you to integrate Circuit Mono Station with other hardware in exactly the way you need.

Circuit Mono Station is able to send and receive MIDI data both via the USB port 8 and the dedicated MIDI IN and MIDI OUT sockets 3. Use the 3.5 mm TRS jack-to-5-pin DIN breakout cables supplied to use standard MIDI cables to connect the latter to other MIDI equipment.

MIDI Tx/Rx

The first two pads in the bottom row are illuminated green and control MIDI Note data Rx and MIDI Note data Tx respectively. A dim illumination means that Tx or Rx is OFF; a bright illumination indicates that Tx or Rx is ON.

The transmission and/or reception of MIDI CC data can be controlled in exactly the same way by the next two pads, coloured Orange.

Similarly, MIDI Clock Tx and Rx are controlled by the blue-lit pads at the right-hand end of the bottom grid row. Note that these buttons also effectively control selection of the analogue clock input. If Clock Tx is on, Circuit Mono Station is the clock master and its internal clock will be available as MIDI Clock at the rear panel USB and **MIDI OUT** connectors, and also in analogue form at the **CLOCK OUT** connector. If Clock Rx is on, Circuit Mono Station becomes a clock slave, and will use an externally applied clock according to the following hierarchy:

PRIORITY	CLOCK SOURCE	NOTES
1	Analogue	Analogue always has priority if present
2=	USB MIDI	If MIDI Clock is present at both connectors, Circuit Mono Station will use the one it detects first
2=	MIDI IN (DIN)	

If a clock signal cannot be detected at any of the external inputs, Circuit Mono Station will use its internal clock.

MIDI Channel

The two upper rows of the grid are used to select the MIDI channels in use. The 16 pads simply correspond to MIDI Channels 1 to 16. You can transmit and receive MIDI Note data for the notes forming Oscillator 1's Pattern independently from those for Oscillator 2. The pad colours reflect the selected Oscillator (via the Osc buttons 5).

The pad for the currently active MIDI channel is brightly lit, while the others will be either dimly lit in the same colour or dimly lit red. There will always be two pads lit in red: one will be Pad 16, because MIDI Channel 16 is reserved for MIDI Tx/Rx of global data and is not available for Note information, and one other MIDI channel will always be assigned to the other Oscillator.

Default Settings are MIDI Channel 1 for Osc 1 and Channel 2 for Osc 2. To select a different Channel, simply press the appropriate pad.

Analogue Clock Rates

Circuit Mono Station outputs a continuous analogue clock from the rear panel **CLOCK OUT** connector (4) at an amplitude of 5 V. The frequency of this clock is related to the tempo clock (internal or external). The output clock rate is set with the first five buttons on the third row of the grid (Pad Nos. 17-21). You can select the rate to be 1, 2, 4, 8 or 24 ppqn (pulse per quarter note) by pressing the appropriate pad. The default value is 2 ppqn. The following table summarises the settings:

Pad	Analogue clock rate
17	1 ppqn
18	**2 ppqn**
19	4 ppqn
20	8 ppqn
21	24 ppqn

Note that Swing (if set to something other than 50%) is not applied to the analogue clock output.

An external analogue clock signal in the voltage range -0.5 V to +5.5 V may be applied to the **CLOCK IN** connector (5). An input below 1 V will be seen as 'low' and an input above 2.3 V will be seen as 'high' and a clock event is triggered by a low to high transition. The input clock rate is fixed at 2 ppqn.

Pot Pickup

The operation of Pot Pickup is described at page 71. It is enabled in ***System Settings View*** with Pad 24, which will be lit Yellow, either dim (off) or bright (on).

IMPORTANT

For any changes made to System Settings View to be retained, Circuit Mono Station must be powered off by the rear panel power switch in the normal way. Disconnecting the external PSU will cause errors.

SESSION SWITCHING

A basic overview of loading and saving Sessions can be found at page 22. This chapter looks at some additional aspects surrounding the use of Sessions.

There are some rules governing how Circuit Mono Station responds when you change from one Session to another. If you're in Stop Mode (i.e., with the sequencer not running) and change Session in ***Sessions View***, when you press the **Play** button, the new Session will always begin from Step 1 of the Pattern; if the Session comprises chained Patterns, it will begin at Step 1 of the first Pattern. This will be the case regardless of which step the sequencer was at when the previous Session was stopped. The tempo of the new Session will replace that of the previous one.

There are two options of changing Sessions while in Play Mode:

1. If you simply select a new Session by pressing its pad, the current Pattern will play through to its last step (note – only the current Pattern, not a complete chain of Patterns), and the pad for the new Session will flash blue/white to indicate that the next Session is "cued". The new Session will then begin playing from Step 1 of its Pattern, or Step 1 of the first Pattern in a chain if the Session comprises a chain.
2. If you hold down **Shift** while selecting a new Session, the current Pattern will stop playing on the next step and switch immediately to the new Session. The new Session will play from the same step in the Pattern chain that the previous Session had reached. This obviously gets complicated (and often musically interesting!) when the two Sessions either contain Patterns of different lengths, or different numbers of Patterns making up a Pattern chain. As we have mentioned elsewhere in this User Guide, experimentation is often the best way of understanding how Circuit Mono Station deals with this.

Clearing Sessions

Clear 13 may be used in ***Sessions View*** to delete unwanted Sessions. Select the Session to be deleted, then press and hold **Clear**; it illuminates bright red and all the grid pads extinguish except that for the selected Session, which illuminates bright white. Press this pad to delete the Session; the pad flashes rapidly for a second or so.

Note that this procedure makes it possible to only delete the currently selected Session; this provides a safeguard against deleting the wrong Session. Always check that a Session pad contains the Session you want to delete by playing it before you hit **Clear**.

Note that disabling Save also disables the Clear function, and therefore it is not possible to delete a Session if Save is disabled (the state that Circuit is shipped in from the factory). See page 23 for details of how to enable Save.

APPENDIX

Firmware Updates

Go to components.novationmusic.com and follow all instructions.

Bootloader Mode

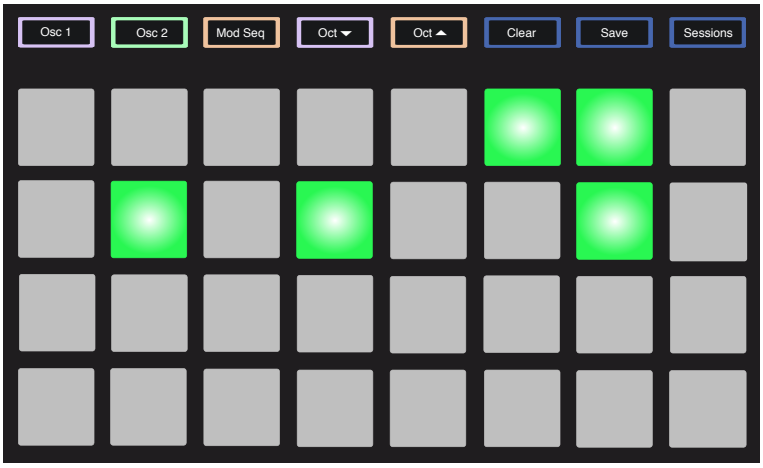
In the unlikely event of a problem with your Circuit Mono Station, it may become necessary to enable Bootloader Mode. This is strictly an “engineering mode”, and all normal unit functions become inoperative. You should not use Bootloader Mode without instructions to do so from Novation’s Technical Support team.

Bootloader Mode lets you check the version numbers of the currently installed firmware, and also to update firmware (and factory Patches) should the Firmware Update procedure described above not work correctly for any reason.

To enter Bootloader Mode:

1. Turn Circuit Mono Station off
2. Hold down the **Scales** [8], **Note** [6] and **Velocity** [6] buttons
3. Power Circuit Mono Station on again

Circuit Mono Station will now be in Bootloader Mode, and the grid display will look something like this:



Osc 1 and **Osc 2** are lit; selecting each of these generates a pattern of illuminated pads; the pattern represents the version numbers of the firmware elements in binary form. You may need to describe these patterns to Novation’s Technical Support Team in the event of a problem.

Bootloader Mode is most easily exited by simply pressing the **Play** button. Circuit will then reboot into the normal operating state.

Initial Patch Parameters

The list below gives the parameters of **Init Patch**:

Section	Parameter	Initial Value
Oscillator	Osc 1 fine	0 (centre)
	Osc 1 range	8' (A3=440Hz)
	Osc 1 coarse	0 (centre)
	Osc 1 waveform	saw
	Osc 1 Shape (Pulse Width)	0
	Osc 2 fine	0 (centre)
	Osc 2 range	8' (A3=440Hz)
	Osc 2 coarse	0 (centre)
	Osc 2 waveform	saw
	Osc 2 shape (pulse width)	0
	Osc 1/2 Sync	Off
Mixer	Osc 1 level	100
	Osc 2 level	100
	Sub Osc level	0
	Noise level	0
	Ring mod level	0
	External signal level	0
Filter	Slope	24dB
	Shape	LP
	Frequency	255
	Resonance	64
	Overdrive	0
	Noise bypass	Off
	Oscillator 2 bypass	Off
	Filter key tracking	Off
Distortion	Type	I
	Amount	0
LFO	LFO Rate	75
	LFO Wave	triangle
	LFO Sync on/off	off

Section	Parameter	Initial Value
Envelope	Attack	0
	Decay	70
	Sustain	100
	Release	10
Mod Matrix	Envelope destinations	Amp
	LFO destinations	none
	Mod Seq destinations	none
	Velocity destinations	none
	Envelope > Amp Depth	1
	All other Mod Matrix routings are ‘off’	
Misc	Patch level	100
	Octave tranpose	0

Session loading problems

Circuit loads the last selected Session when it is powered-up. It is possible that if the power was interrupted while a session was being saved it may have become corrupted in some way. This might mean that Circuit ends up in some anomalous state at power on.

Although this is a very unlikely occurrence, we have included a method of turning Circuit on and forcing it to load a blank Session instead. To do this, hold down both **Shift** and **Clear** while turning Circuit on.

If any Sessions do become corrupted in any way it is always possible to delete them by using Clear Session (see page 89)