



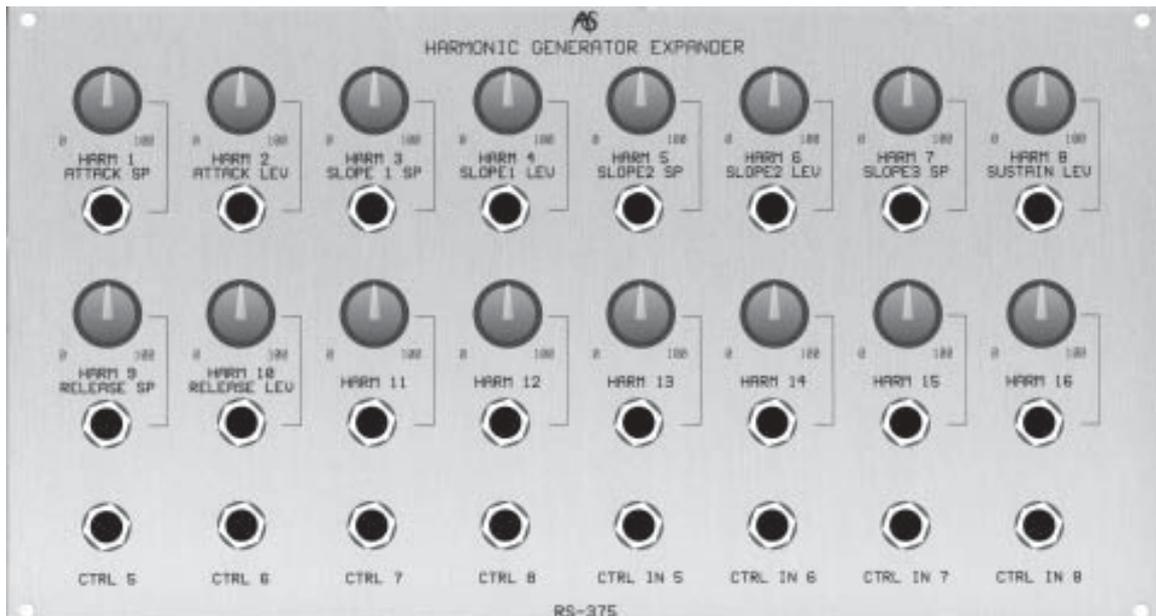
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# RS370, RS375 & RS376

POLYPHONIC HARMONIC GENERATOR, HARMONIC GENERATOR EXPANDER AND PHG EXPANDER



RS370 Polyphonic Harmonic Generator



RS375 Harmonic Generator Expander



The RS376 PHG Expander

When people talk about synthesis, they normally concentrate on two forms: analogue synthesis, and "S&S", which is an abbreviation of "sample + synthesis". In the former case, the initial waveforms are produced by analogue circuits that generate fluctuating voltages (oscillations) that are then modified by the actions of analogue filters and amplifiers before being presented to the outside world. Famous examples of such synthesisers include such classics as the Minimoog, the ARP Odyssey, and the Prophet 5. In the latter case, waveforms are held in digital memory of one form or another, modified by mathematical algorithms that perform the same actions as analogue filters and amplifiers, and then output through a digital-to-analogue converter. Almost all modern workstations operate on this principle, so examples include the Korg Triton™ series, the Roland Fantom™ series, and the Yamaha Motif™ series.

There are now many other forms of digital synthesis. These include virtual analogue physical modelling, which uses high-speed digital signal processors to imitate the quirks and sounds of true analogue synthesis, as well as more traditional forms such as digital additive synthesis and FM synthesis. But in between the heyday of the analogue synthesisers (the 1970s and early 1980s) and the dominance of the S&S and other digital synthesisers (1988 to the present day) there was a short era in which a hybrid of analogue and digital synthesis was popular. In these instruments, the initial waveforms were held in, and output from, a digital Read Only Memory (ROM) but then modified using analogue filters and amplifiers. Some quite popular (low cost) and highly regarded (rather expensive) instruments fell into this category, including the Korg DW6000 and DW8000, and the revered PPG2.0 and PPG2.2.

The ROMs in these instruments were capable of holding brief snippets of many waveforms, so synthesisers based on this architecture were in principle capable of generating a wider range of initial timbres than their analogue cousins, although the range of fundamental tones that they could produce was still limited by the number of waveforms held in their ROMs. This limitation was particularly evident with the Korgs, although less so on the PPGs, which offered hundreds of single-cycle waves in their 'wavetables'.

The way forward was signalled by one of the most underrated synthesisers of the 1980s, the Kawai K3. This combined a somewhat esoteric method of building waveforms known as 'additive synthesis' (which allows you to construct waveforms from their constituent harmonics) with the hybrid digital/analogue synthesis used by the Korgs and PPGs. The combination of technologies produced excellent results, but the K3 appeared just as the world was falling in love with S&S workstations. Lacking the sophisticated effects structures, rhythm samples, multitrack sequencers and other paraphernalia of these new instruments, the Kawai was largely overlooked, even though it was capable of generating a unique family of sounds.

The story might have ended here, and this form of additive+analogue hybrid synthesis might have disappeared forever. However, it is now reborn in the form of the RS370, an 'additive' sound generator that allows you to build and store waveforms in digital form, but which allows full analogue CV control over many of its functions. Add to this either of the RS375 and RS376 Expanders, and you have a uniquely powerful and flexible digital sound generator that integrates fully with everything that a powerful analogue modular synthesiser can offer, and which extends modular synthesis in ways that have never before been possible.

## INTRODUCTION TO THE RS370 FAMILY

The RS370 is a self-contained digital synthesiser that runs on a TMS320VC5412 digital signal processor. It offers multiple modes of operation and can connect in a variety of ways with your analogue synthesisers and MIDI-equipped systems. It is also a powerful MIDI to CV converter that you can use independently of the internal sound generator.

**To make sense of the RS370, let's start by looking at the sound generator itself:**

- it is 6-note polyphonic
- it incorporates no fewer than 24 digital oscillators, so each note (or 'voice') comprises up to four oscillators (although each uses the same waveform)
- it offers a range of common waveforms, but you can create a huge number of new waves using additive (also called 'Fourier' or 'harmonic') synthesis
- each additive oscillator comprises 32 harmonics
- each of the four oscillators in a voice can be independently detuned... which means that a note can contain up to 128 independent 'partials'

**Many additional features help you to obtain the most from the sound generator. These include:**

- independent audio amplifiers and outputs for each voice
- independent 6-stage EGs for each voice, internally routed to the audio amplifiers
- 'vintage drift' to emulate the tuning instabilities and warmth of analogue synthesisers
- dual LFOs
- a multi-mode arpeggiator
- forty-six patch memories

**You can control all of this using analogue CVs and MIDI controllers. Furthermore, you can use the CTRL outs to control external modules and synthesisers as well as the internal sound generator. Facilities include:**

- MIDI In and Thru (with activity LED)
- six pitch CV outputs
- six Trigger outputs that you can configure as triggers, gates, or S-Trig outputs
- three CV inputs that you can direct to a variety of internal destinations
- four MIDI/CV CTRL outs that respond individually to over 130 MIDI controllers

**To all of the above, the RS375 Expander adds:**

- sixteen control knobs linked to sixteen CV inputs, which together allow you to adjust the envelopes and control the amplitudes of the first sixteen harmonics of additive sounds in real-time
- four additional CV inputs
- four additional CTRL outputs

**Alternatively, the RS376 Expander adds:**

- four additional CV inputs
- four additional CTRL outputs
- a single control knob

## GETTING STARTED

You should hook up your RS370 so that you can obtain sound from it *before* you begin to experiment with the commands and controls described in this chapter. Follow the instructions below. This will help you to obtain a full grasp of the module as you work through the menus.

1. Read the section "Navigating the RS370" so that you know how to follow these instructions.
2. Connect a MIDI cable from the MIDI output of a controller keyboard to the MIDI In of the RS370.
3. Ensure that the MIDI Transmit channel of the keyboard is the same as the MIDI Receive channel of the RS370. (Menu 7.3.)
4. Connect the "VOICE 1" output to the input of a receiving device such as a mixer or the input to an audio amplifier.
5. Check that all six voices are being sent to the VOICE1 output by selecting "All outputs mixed" in menu 2.1.6 - Synthesiser/Voice outputs/Output mixing.
6. Select menu 1 (Copy from memory) and choose any of the patches that takes your fancy.
7. Play. If no sound is produced, check that the MIDI activity LED flashes as you the press keys on the MIDI keyboard, and that all the connections are correct.
8. Play. If you still have no output, ensure that you have not sent a MIDI CC#7 (Volume) = 0 to the RS370. This will silence the module, even if all other settings appear correct.
9. Play again.

When used in this way, the RS370 acts like any other 6-voice polyphonic synthesiser, generating and shaping up to six notes simultaneously.

*Note: Some of the factory patches are monophonic, so do not panic if your RS370 appears only to produce a single note. Select an alternative patch, and all should be well.*

## MODES

Before starting, it's important to understand that the RS370 offers four modes of operation, and that the menu structure may differ slightly depending on which mode is selected.

You can split the modes into two groups: *polyphonic*, and *real-time*:

- The two polyphonic modes allow you to play all six voices simultaneously, but neither allows you to modify the harmonic content of additive waveforms while playing.
- The two real-time modes allow you to modify the harmonic content of additive waveforms in real-time (hence the name) but you are restricted to just a single voice, thus transforming the RS370 into a monophonic synthesiser.

### THE MODES ARE:

#### Polyphonic MIDI

Polyphonic: The RS370 acts as a 6-voice polyphonic sound generator.  
MIDI: The RS370 also acts as a 6-channel MIDI/CV converter. The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 therefore become MIDI/CV outputs.

#### Polyphonic analogue

Polyphonic: The RS370 acts as a 6-voice polyphonic sound generator.  
Analogue: The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 become analogue inputs.

#### MIDI real-time

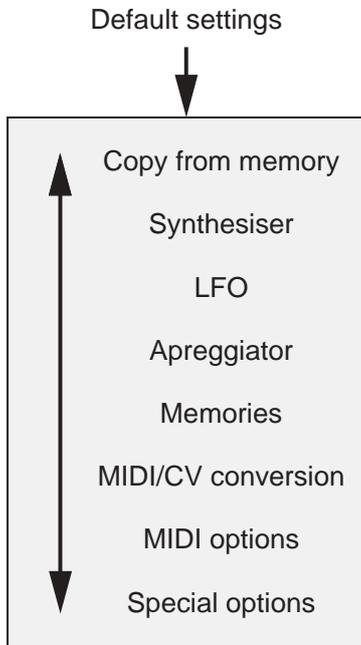
Real-time: The RS370 acts as a monophonic harmonic synthesiser with one voice comprising four oscillators. You can modulate the harmonic levels of a sound in real-time, immediately hearing the effect on the sound.  
MIDI: The RS370 also acts as a 6-channel MIDI/CV converter. The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 therefore become MIDI/CV outputs.

*Note: This mode is useful only when used in conjunction with the RS375 Expander.*

#### Analogue real-time

Real-time: The RS370 acts as a monophonic harmonic synthesiser with one voice comprising four oscillators. You can adjust the harmonic levels of a sound in real-time, immediately hearing the effect on the sound.  
Analogue: The CV 1 socket becomes a dedicated 1V/Oct pitch control input.

*Note: This mode is useful only when used in conjunction with the RS375 Expander.*



## NAVIGATING THE RS370

The RS370 is controlled by the menus displayed on its graphic LCD. This display is backlit to aid its use in darkened conditions.

- Navigate through the menu structure by **rotating** the EDIT knob.
- Select a menu by **pressing** the EDIT knob.
- Navigate through any menu by **rotating** the EDIT knob.
- Move "down" to select a sub-menu or list of options by **pressing** the EDIT knob.
- Alter a value by **rotating** the EDIT knob.
- Save a change (and, where appropriate, return to the previous level) by **pressing** the EDIT knob.
- Jump "up" a level by **pressing** CANCEL.
- Leave an option or parameter unchanged and return to the menu containing it by **pressing** CANCEL.

### Menu numbering

The menu hierarchy of the RS370 is quite extensive, so we rationalise it by thinking in terms of major heading, followed by sub-menus, sub-sub-menus, and so on.

When you press one of the options in the start-up screen, you will enter one of the menus as follows:

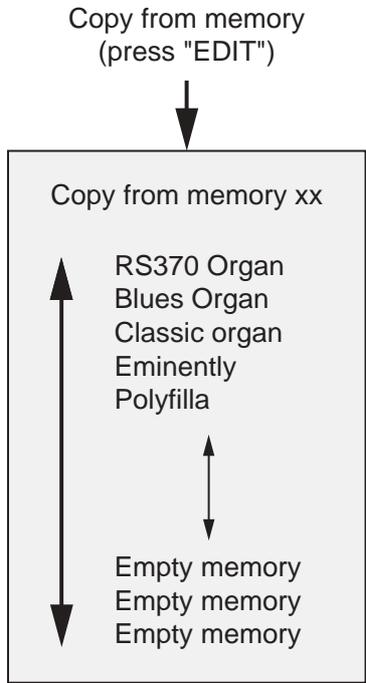
Menu 1:	Copy from memory
Menu 2:	Synthesiser
Menu 3:	LFO
Menu 4:	Arpeggiator
Menu 5:	Memories
Menu 6:	MIDI/CV conversion
Menu 7:	MIDI options
Menu 8:	Special options

In most cases you will now have the option to select further sub-menus that we refer to as "menu x.x".

For example, if you press EDIT to enter the "Synthesiser" menu, and then press EDIT again to select the "Voice outputs" sub-menu (which is the first item in the list), you enter menu 2.1. This in turn offers sub-sub menus, which are numbered 2.1.1... and so on.

### *A bit of advice...*

*The RS370 is a powerful module, so you may find it a little daunting at first. Nonetheless, it is remarkably simple to use once you have come to grips with the menu structures. Experiment freely, as this is the best way to learn the system. If you need help, please email Analogue Systems for support.*



### MENU 1: COPY FROM MEMORY

The RS370 offers forty-six patch memories, of which twenty-three are populated by factory sounds. You can overwrite any memory. The instructions for doing so - plus options for all the other memory-related functions - are given in menu 5.

Menu 1 allows you to select any stored patch and load this into the edit buffer\*. When you do so, the patch name is displayed at the top of the screen.

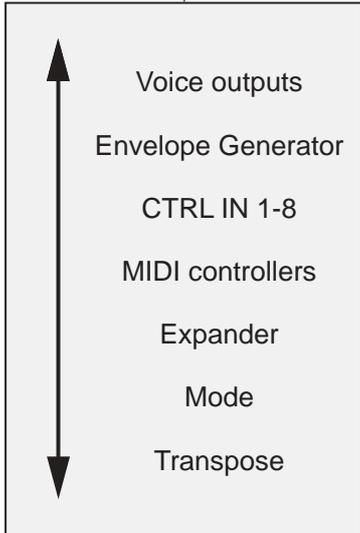
The factory patches are:

- RS370 Organ
- Blues Organ
- Classic organ
- Eminently
- Polyfilla
- Golden Age
- OK Chorale
- Roller Coaster
- Nifty Pulse
- Touch Ensemble
- Memorymoog 1
- Soft Lead
- Fantasy
- Arplatch
- Heaven
- In The Air
- Repeater
- Transformer
- Modwheel Morph
- Morphing
- Mysterious
- Chimes
- Purity

**\* Important note:**  
*All operations on a sound are carried out in the edit buffer. This is an area of memory that lies 'on top of' the patch storage system. Any changes made to the current sound are lost if not saved to a patch memory. However, this also means that, if you change a sound in ways that you do not like, you have not damaged the saved sound.*



Synthesiser  
(press "EDIT")



## MENU 2: SYNTHESISER

This menu provides access to the voicing of the synthesiser within the RS370, as well as to many of its control functions.

There are seven sub-menus:

Menu 2.1	Voice outputs
Menu 2.2	Envelope Generator
Menu 2.3	CTRL IN 1-8
Menu 2.4	MIDI Controllers
Menu 2.5	Expander
Menu 2.6	Mode
Menu 2.7	Transpose

### NOTES ABOUT SYNTHESISER CONTROLLERS

Menus 2.3.1 and 2.4.2 offer access to the internal destinations that you can modulate using external CVs and MIDI controllers. Most of these are self-explanatory, but be aware of the following:

- **Mixing controllers**

In short... you can't. If a destination is already subject to control from a CV CTRL IN, a MIDI controller or an LFO, you can't assign it as the destination of a second controller and mix the effect of the two. The second will always replace the first.

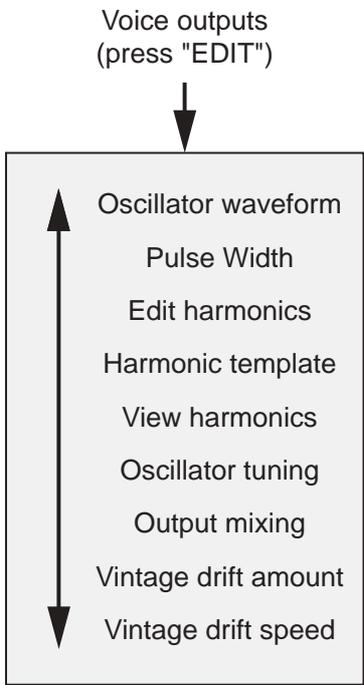
*Note: Controlled destinations are shown by a "!" preceding the destination name in the Controls lists.*

- **Fine Pitch and Fine Pitch 2**

To overcome the above, the RS370 provides two Fine Pitch destinations that allow you to use two controllers to affect the pitch. The operation of the two is identical.

- **Harmonic Wave Morph**

This destination is unique to the RS370, and allows you to sweep the waveform from a sine wave to a square wave and back again in an endless 'morphing' cycle. This is very different from PWM and other waveshaping operations because it is applied at the spectral level, resulting in a unique sound.



### MENU 2.1: VOICE OUTPUTS

There are up to nine sub-menus accessed from menu 2.1. These are:

- Menu 2.1.1 Oscillators waveform
- Menu 2.1.2 Pulse Width
- Menu 2.1.3 Edit harmonics
- Menu 2.1.4 Harmonic template
- Menu 2.1.5 View harmonics
- Menu 2.1.6 Oscillator tuning
- Menu 2.1.7 Output mixing
- Menu 2.1.8 Vintage drift amount
- Menu 2.1.9 Vintage drift speed

The menu selection that appears is determined primarily by the MODE selected in menu 2.6, the waveform selected in menu 2.1.1, and the status of the RS375 Expander Control parameter (if connected) in menu 2.5.1. The options are:

• **MODE = Polyphonic MIDI or Polyphonic analogue**

- Menu 2.1.1 Oscillators waveform
- Menu 2.1.2 Pulse width (*Waveform = square*)
- Menu 2.1.3 Edit harmonics (*Waveform = synthesised*)
- Menu 2.1.4 Harmonic template (*Waveform = synthesised*)
- Menu 2.1.6 Oscillator tuning
- Menu 2.1.7 Output mixing
- Menu 2.1.8 Vintage drift amount
- Menu 2.1.9 Vintage drift speed

• **MODE = MIDI real-time or Analogue real-time**

- Menu 2.1.3 Edit harmonics (*Expander/Controls ≠ Harmonic levels*)
- Menu 2.1.4 Harmonic template (*Expander/Controls ≠ Harmonic levels*)
- Menu 2.1.5 View harmonics (*Expander/Controls = Harmonic levels*)
- Menu 2.1.6 Oscillator tuning
- Menu 2.1.7 Output mixing
- Menu 2.1.8 Vintage drift amount
- Menu 2.1.9 Vintage drift speed

### 2.1.1 Oscillator waveform

Select from four conventional synthesiser waveforms:

- sine wave
- triangle wave
- sawtooth wave
- square wave

The fifth option - "synthesised" - provides access to the additive synthesis engine, and makes menus 2.1.2 and 2.1.3 visible.

*Note: With "square" selected, the pulse width menu appears, and you are able to obtain pulse width modulation (PWM).*

### 2.1.2 Pulse Width

With the square wave selected in 2.1.1 you can determine the pulse width in the range 0 to 127.

A pulse width of 64 produces a square wave.

### 2.1.3 Edit harmonics

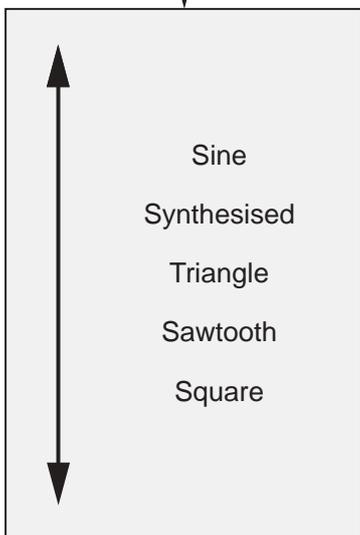
Use this to create new waveforms by selecting harmonics and assigning amplitudes to each.

• **Harmonic number**  
You may select harmonics in the range 1 to 32.

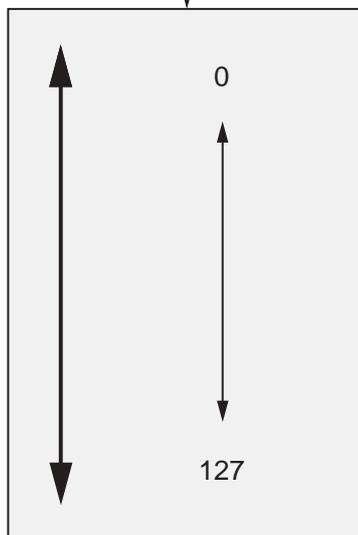
• **Amplitude**  
You may select amplitudes in the range -127 to +127. A negative amplitude denotes an harmonic with inverted phase (i.e. 180° out of phase with respect to an harmonic that has a positive amplitude).

As you create a new sound, the harmonic spectrum is displayed on the left of the screen, and the waveform is displayed on the right of the screen.

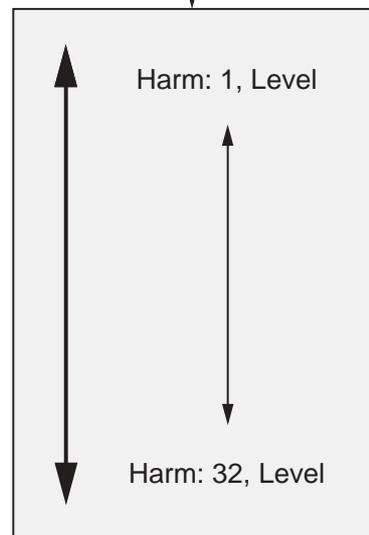
Oscillator waveform  
(press "EDIT")



Pulse Width  
(press "EDIT")



Edit harmonics  
(press "EDIT")



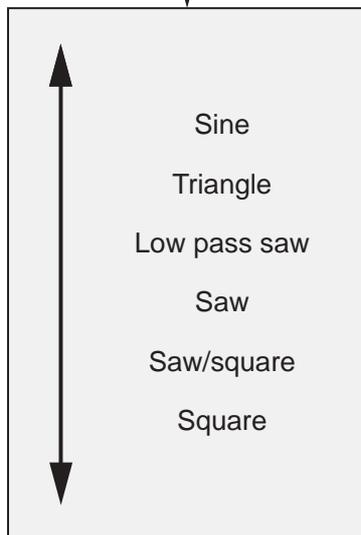
### 2.1.4 Harmonic template

Six harmonic templates are available:

- sine wave
- triangle wave
- low-pass sawtooth wave
- sawtooth wave
- saw/square mixture
- square wave

Selecting any of these inserts the waveform into the harmonic editor, whereupon you can modify it using menu 2.1.3.

Harmonic template  
(press "EDIT")



### 2.1.5 View harmonics

This is a visual aid to programming, particularly useful when creating new sounds using an RS375 Expander (if connected) to control the amplitudes of the harmonics. It provides a visual display in three parts:

- **Harmonic display**

The amplitudes of the first sixteen harmonics

- **Waveform display**

The waveform generated by the first sixteen harmonics

- **Programming display**

The Harmonic number and Level of the harmonic most recently edited using the knobs on the RS375 Expander

*Note: This display is particularly useful for inspecting the changes introduced by Harm Wave Morph and other spectral modulations.*



### 2.1.6 Oscillator tuning

Every voice can comprise up to four oscillators. These all have the same waveform, but can be detuned with respect to one another to create lush textures.

- **Level**

Each oscillator may have a level ranging from 0 (silence) to 127 (maximum)

- **Pitch**

Each oscillator can be detuned sharp or flat by approximately 10% (roughly a semitone in either direction).

Oscillator tuning  
(press "EDIT")



### 2.1.7 Output mixing

The RS370 provides six front panel outputs annotated as VOICE 1, VOICE 2 ... VOICE 6.

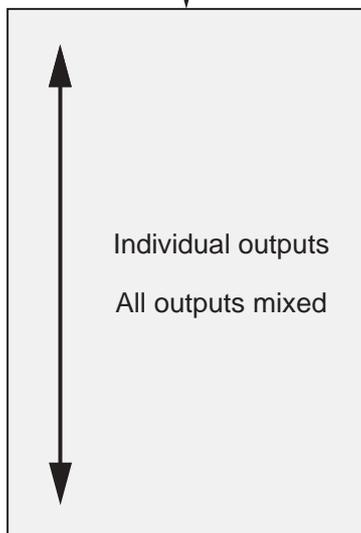
- **All outputs mixed**

To use the RS370 conventionally, with all voices accessible simultaneously from a single output, select "All outputs mixed". The full polyphony is then available from all six physical outputs.

- **Individual outputs**

There are occasions when it is useful to obtain individual voices from separate outputs, perhaps so that you can treat each of them differently using external effects units. To do so, select "Individual outputs", whereupon voice 1 will be available from the VOICE 1 output, voice 2 from the VOICE 2 output, and so on.

Output mixing  
(press "EDIT")



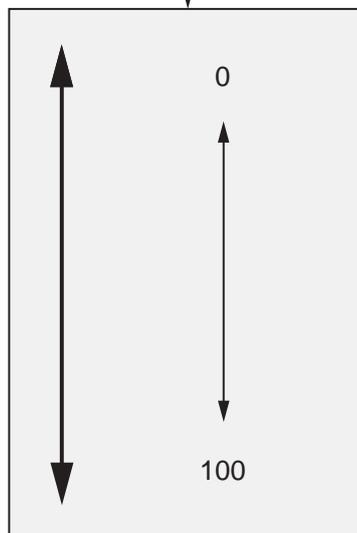
### 2.1.8 Vintage drift amount

If you wish the RS370 to emulate the oscillator drift of an analogue synthesiser, increase this parameter (which sets the maximum amount of drift) to taste.

*Note: This parameter does not cause the frequency of the note played to drift, but modifies the amount of detune of each oscillator around the 'correct' pitch. This thickens the sound and introduces analogue-style variations in the sound without causing notes to sound out-of-tune.*

Use the Vintage drift amount in conjunction with 2.1.9: Vintage drift speed.

Vintage drift amount  
(press "EDIT")

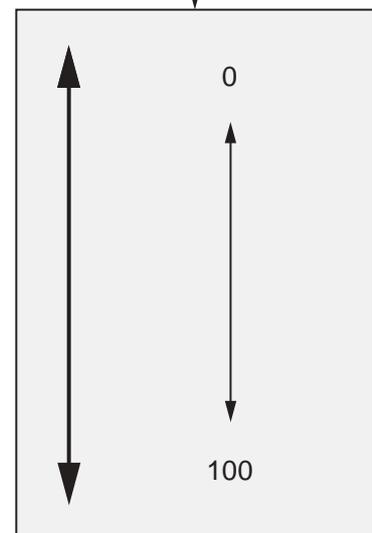


### 2.1.9 Vintage drift speed

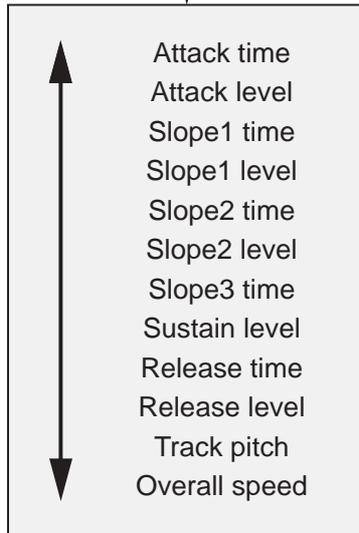
If you wish the RS370 to emulate the oscillator drift of an analogue synthesiser, increase this parameter (which sets the rate of drift) to taste.

Use the Vintage drift speed in conjunction with 2.1.8: Vintage drift amount.

Vintage drift speed  
(press "EDIT")



Envelope generator  
(press "EDIT")



## MENU 2.2: ENVELOPE GENERATOR

Unlike analogue envelope generators, which are usually limited to four steps, the RS370's six, digitally generated envelope generators each offer six steps.

Each of the five Levels and each of the five Times can assume values in the range 0 to 127. What's more, there is no restriction that states that the Attack level must be the highest level, or that the Slope 2 level must be lower than the Slope 1 level... and so on. This means that the RS370 envelope generators are far more flexible than conventional ADSRs.

Two further parameters - *Track pitch* and *Overall speed* - affect the overall response of the contour determined by the other envelope parameters.

### The Envelope parameters

- Attack time
- Attack level
- Slope 1 time
- Slope 1 level
- Slope 2 time
- Slope 2 level
- Slope 3 time
- Sustain level
- Release time
- Release level

All envelope parameters have a range of 0 to 127.

### • Track pitch - YES/NO

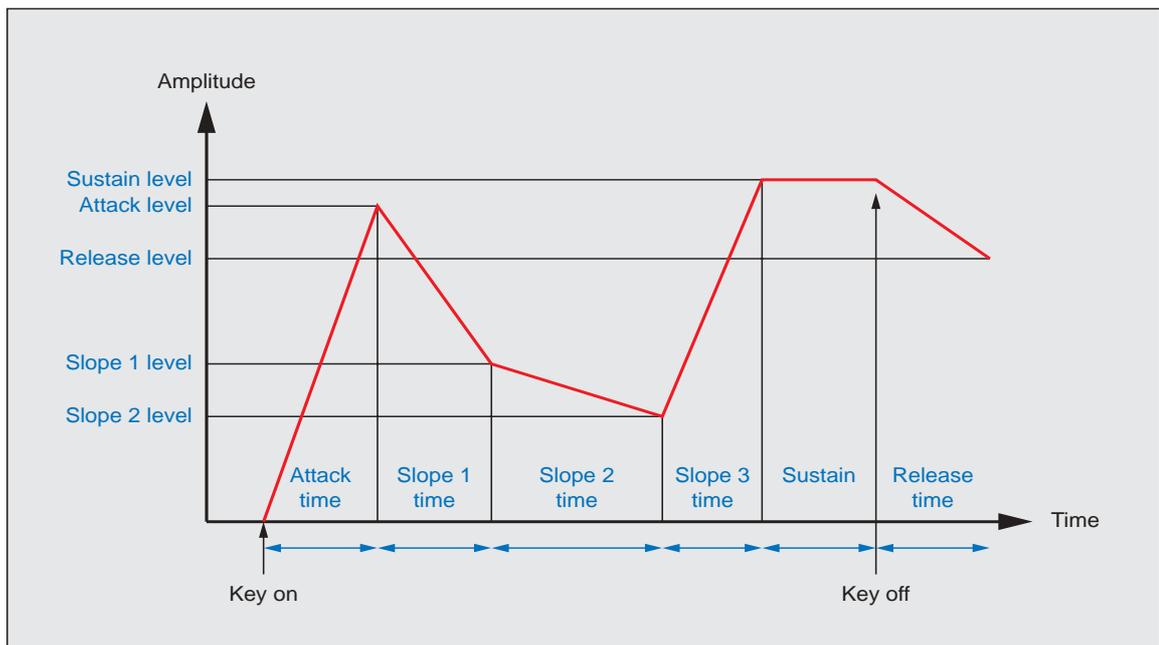
When set to "YES" this will cause the speed of the contour to increase by a factor of two (i.e. to double) for each octave that you play up the keyboard. This imitates the responses of acoustic instruments.

### • Overall speed - 0 to 127

Once you have defined an envelope, you can affect its overall execution speed. Higher values increase the contour rate; lower values decrease it.

This parameter only has effect if Track pitch = NO.

*Note: The relationship between the Overall speed value and the contour rate is approximately a doubling of the rate for an increase of 10 in the parameter value. This means that the total range is a little under "two to the power of thirteen", which is approximately a factor of 8,000.*



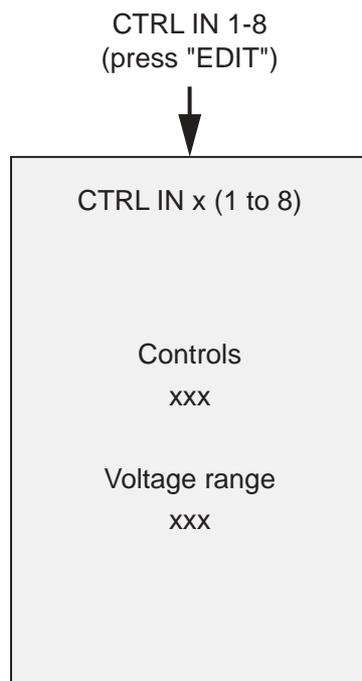
## MENU 2.3: CTRL IN X

The RS370 offers four CV controllers that you can route to a variety of destinations.

CTRL IN 1 is a knob, whereas CTRL IN 2, 3 and 4 are sockets.

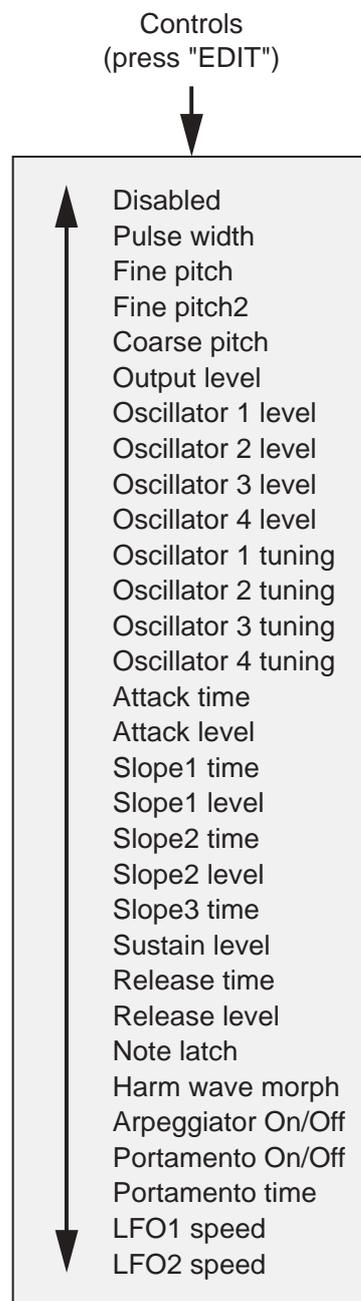
Menu 2.3 allows you to assign the destination controlled by the knob and the inputs. It also allows you individually to select the voltage range expected by each of CTRL IN 2, 3 and 4.

*Note: A further four CV input sockets - CTRL IN 5 to 8 - are provided by the RS375 and RS376 Expanders.*



### 2.3.1 Controls

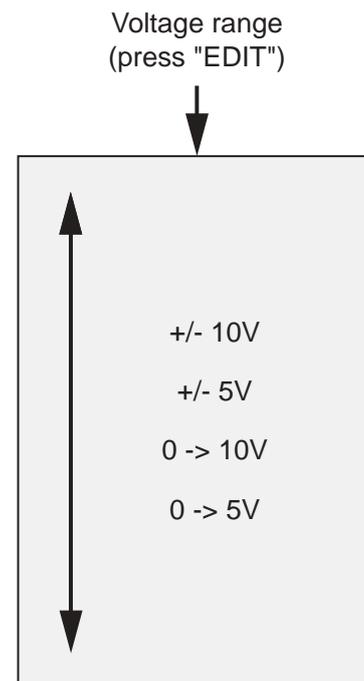
There are thirty destinations, and each CV controller can affect one at a time. Use the "Controls" menu to determine the destination for each.



### 2.3.2 Voltage range

Select the appropriate range individually for each CV input. The options are:

- -10v to +10v
- -5v to +5v
- 0v to +10v
- 0v to +5v

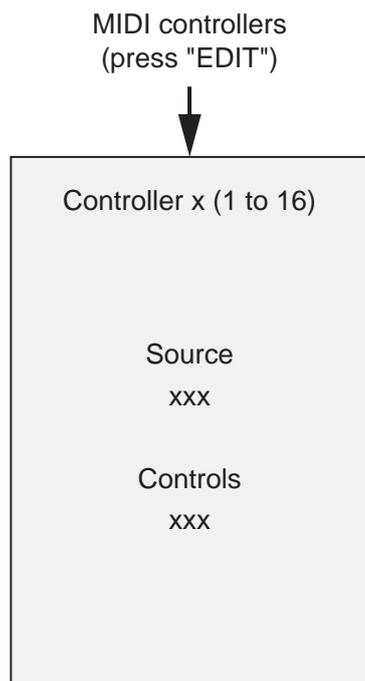


## MENU 2.4: CONTROLLER X

You can further control the RS370 using up to sixteen simultaneous MIDI controllers.

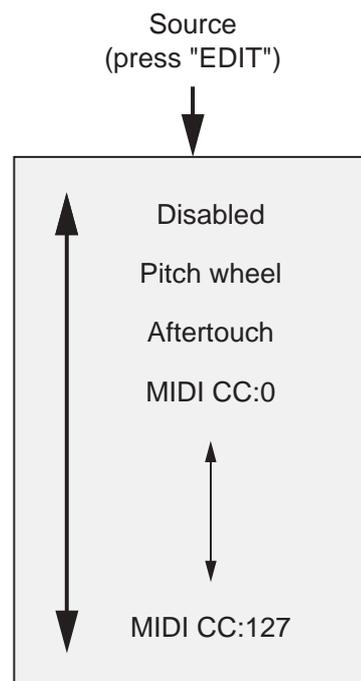
Menu 2.4 allows you to assign the source of each controller, and the destination parameter controlled by each.

*Note: If you use multiple sources, each destination must be unique.*



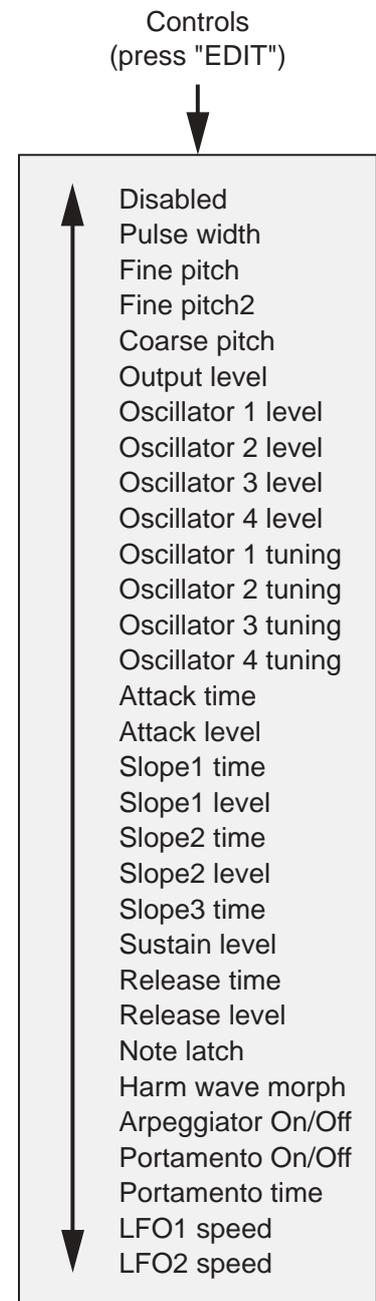
### 2.4.1 Source

There are 130 MIDI control sources. Select one for each controller that you wish to use.

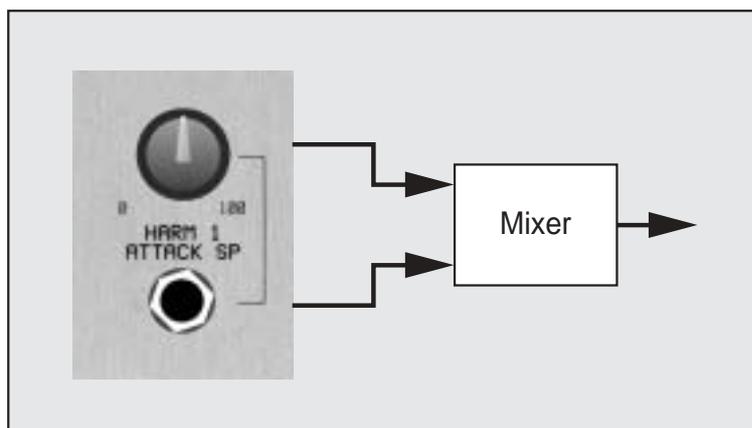


### 2.4.2 Controls

There are thirty internal destinations. Select one for each controller that you wish to use.



## THE RS375 HARMONIC GENERATOR EXPANDER



The RS375 Harmonic Generator Expander adds sixteen control knobs, twenty CV inputs, and four CV outputs to the RS370.

Four of the CV inputs - those marked CTRL IN 5 to CTRL IN 8 - are not affected by menu 2.5, so we will not discuss them here. Likewise, the four outputs - marked CTRL 5 to CTRL 8 - are not affected by menu 2.5, and are covered elsewhere.

The sixteen knobs and sixteen CV inputs controlled by menu 2.5 are arranged in pairs called HARM 1, HARM 2 ... to HARM 16. As you can see from the diagram above, each knob/input combination is linked by a CV mixer unique to that pair. Each knob produces a CV in the range  $\pm 10\text{v}$ , and this is mixed (summed) with any CV applied to the associated CV input.

This combination of manual and remote control is very flexible. If menu 2.5 is set to "Envelope Generator", you can set up each stage of the EG using the first ten knobs, and then modulate every time and level using external CV sources. Alternatively, if menu 2.5 is set to "Harmonic levels" (an option that is only available in MIDI real-time and Analogue real-time modes) you can set the amplitudes of the first sixteen harmonics using the knobs, and then modulate each amplitude using external CVs. This degree of control is unique to the RS370/RS375 combination, and offers myriad possibilities such as modulating each component in the harmonic spectrum using LFOs, EGs, sequencers and manual controllers such as joysticks.

## MENU 2.5: EXPANDER

Select the sub-menus to determine what is controlled by the Expander's knobs and inputs, and what voltage range is used.

### 2.5.1 Controls

The sixteen knobs and their associated CV inputs can control two sets of parameters:

- **Envelope Generator**

Knobs 1 to 10 control the ten contour shape parameters in the Envelope Generator. (See menu 2.2.) You can modulate these parameters by applying CVs to the ten associated CV inputs.

- **Harmonic Levels (real-time modes only)**

Knobs 1 to 16 control the first sixteen harmonics. (See menu 2.1.3.) You can modulate these parameters by applying CVs to the ten associated CV inputs.

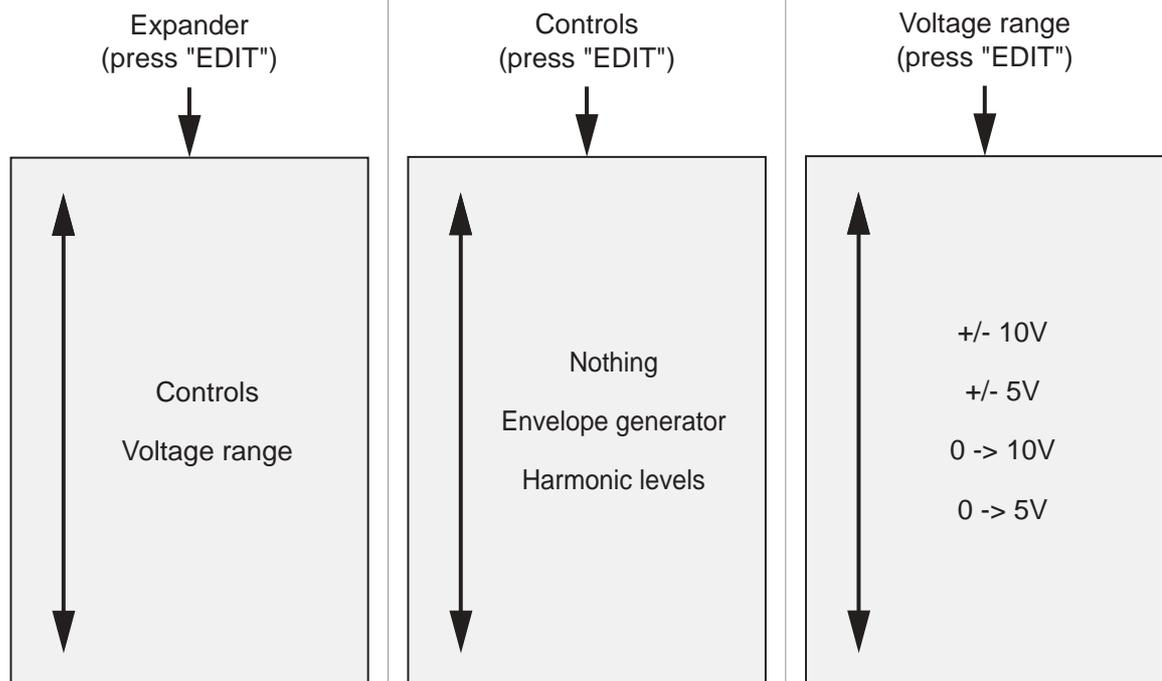
- **Nothing**

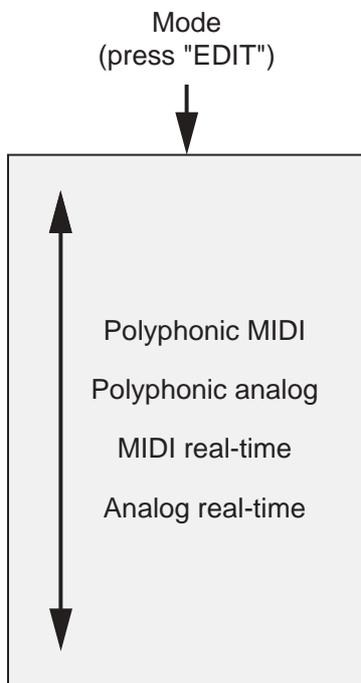
The knobs and CV inputs are defeated, and have no effect on the RS370.

### 2.5.2 Voltage Range

This sets the range of voltages accepted by the upper sixteen input sockets on the RS375. The options are:

- -10v to +10v
- -5v to +5v
- 0v to +10v
- 0v to +5v





## MENU 2.6: MODE

The RS370 offers four modes of operation as follows.

- **Polyphonic MIDI**

**Polyphonic:** The RS370 acts as a 6-voice polyphonic sound generator.

**MIDI:** The RS370 also acts as a 6-channel MIDI/CV converter (see menu 6). The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 become MIDI/CV outputs.

- **Polyphonic analogue**

**Polyphonic:** The RS370 acts as a 6-voice polyphonic sound generator.

**Analogue:** The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 become analogue inputs.

- **MIDI real-time**

**Real-time:** The RS370 acts as a monophonic harmonic synthesiser with one voice comprising four oscillators. You can modulate the harmonic levels of a sound in real-time, immediately hearing the effect on the sound.

**MIDI:** The RS370 also acts as a 6-channel MIDI/CV converter (see menu 6). The sockets marked CV1 to CV6 and TRIGGER1 to TRIGGER6 become MIDI/CV outputs.

*Note:* This mode is useful only when used in conjunction with the RS375 Expander.

- **Analogue real-time**

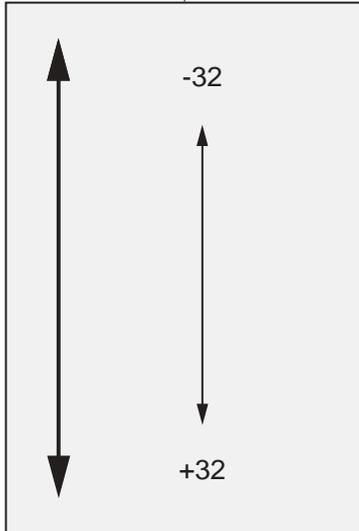
**Real-time:** The RS370 acts as a monophonic harmonic synthesiser with one voice comprising four oscillators. You can adjust the harmonic levels of a sound in real-time, immediately hearing the effect on the sound.

**Analogue:** The CV 1 socket becomes a dedicated 1V/Oct pitch control input.

*Note:* This mode is useful only when used in conjunction with the RS375 Expander.

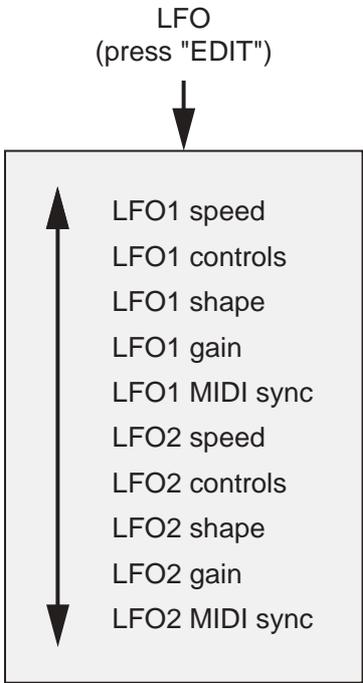


Transpose  
(press "EDIT")



### **MENU 2.7: TRANSPOSE**

You may transpose the output of the RS370 by  $\pm 32$  semitones.

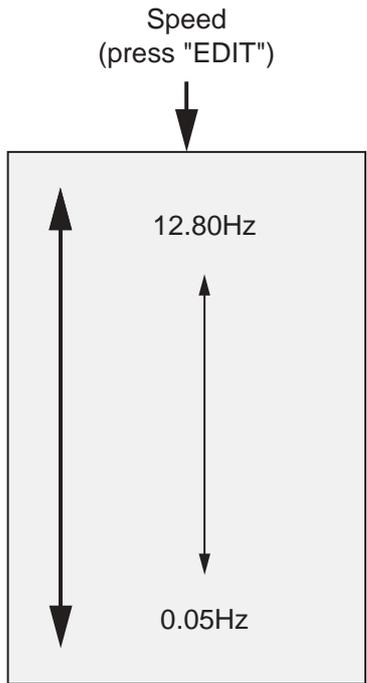


**MENU 3: LFO**

The LFO menu provides access to the shape, rate, amplitude, destination and MIDI sync (if any) of the two LFOs provided within the RS370.

**MENU 3.1: SPEED**

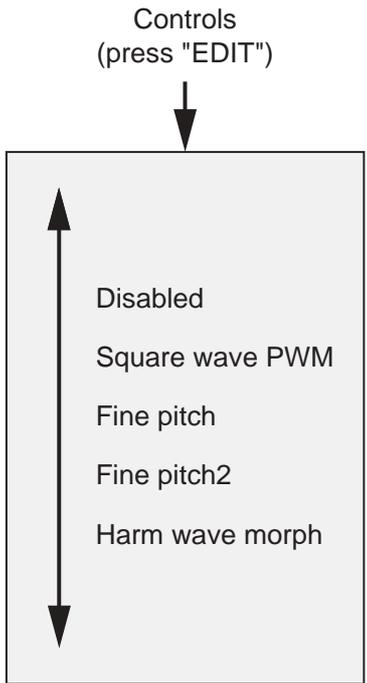
Adjust the LFO speed from 0.05Hz (one cycle every twenty seconds) to 12.80Hz.



**MENU 3.2: CONTROLS**

Select from four destinations (i.e. the parameter that will be modulated by the LFO) or "off". The destinations are:

- **Square wave PWM**  
This recreates the classic PWM sound of analogue synthesisers.
- Note: The square wave must be selected in menu 2.1.1.*
- **Fine pitch**  
Adjusts the pitch by up to ±4 semitones (a major 3rd).
- **Fine pitch2**  
Adjusts the pitch by up to ±4 semitones (a major 3rd).
- **Harm wave morph**  
Sweeps the waveform from a sine wave to a square wave and back again in an endless 'morphing' cycle.

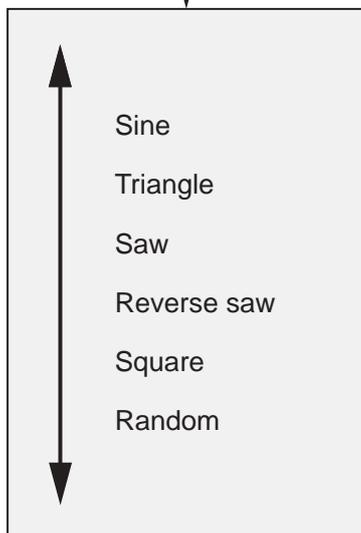


### MENU 3.3: SHAPE

Select from six LFO waveshapes:

- Sine wave
- Triangle wave
- Sawtooth wave
- Reverse saw (ramp) wave
- Square wave
- Random (sample & hold)

Shape  
(press "EDIT")



### MENU 3.4: GAIN

You may control the LFO amplitude dynamically using the mod wheel or aftertouch, or set it to a fixed value.

- **Mod Wheel**

Control the LFO amplitude using the modulation wheel of a MIDI keyboard. (Requires appropriate settings in menu 7.)

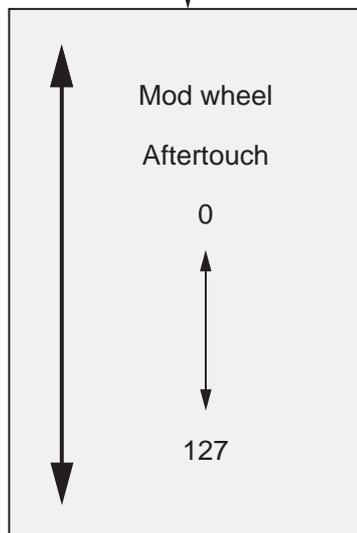
- **Aftertouch**

Control the LFO amplitude using MIDI aftertouch. (Requires appropriate settings in menu 7.)

- **0 to 127**

Set the LFO amplitude to a fixed value in the range 0 to 127.

Gain  
(press "EDIT")

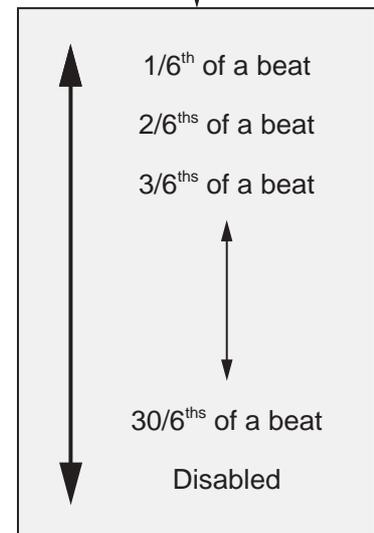


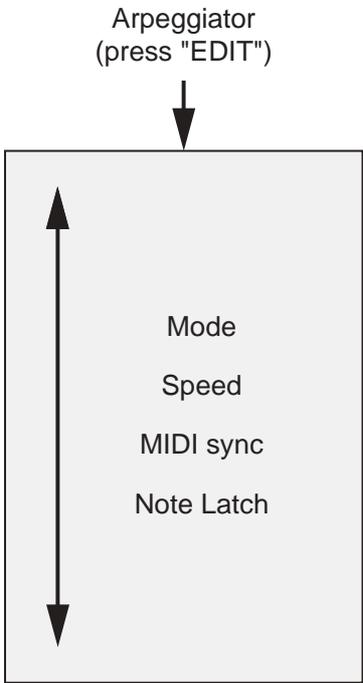
### MENU 3.5: MIDI SYNC

You can synchronise the LFO to MIDI clock, with thirty options ranging from one LFO cycle every 1/6 of a beat, to one LFO cycle every 30/6 of a beat (i.e. one every 5 beats).

When not using MIDI sync, set this parameter to "Disabled". If you do not do so, the LFO will fail to operate when no MIDI clock is detected.

MIDI Sync  
(press "EDIT")





**MENU 4: ARPEGGIATOR**

The RS370 provides a simple monophonic arpeggiator with multiple modes, MIDI sync, and Hold functions.

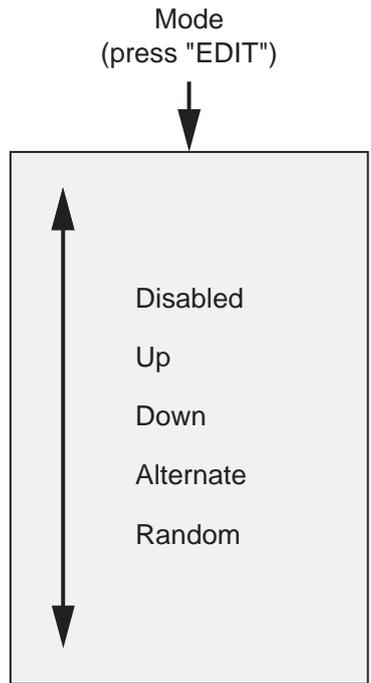
The arpeggiator uses the notes played by the MIDI controller keyboard, and does not extend the sequence over multiple octaves.

**MENU 4.1: MODE**

Select from one of four arpeggiator modes, or "off":

- Up
- Down
- Alternate
- Random

If you do not wish to arpeggiate your sounds, select "Disabled" in this menu.



#### MENU 4.2: SPEED

The arpeggiator will run at rates from 2.825Hz (a little under three notes per second) to 10.101Hz (a little over ten notes per second).

#### MENU 4.3: MIDI SYNC

You can synchronise the arpeggiator to MIDI clock, with thirty options ranging from one note every 1/6 of a beat, to one note every 30/6 of a beat (i.e. one every 5 beats).

When not using MIDI sync, set this parameter to "Disabled". If you do not do so, the arpeggiator will fail to operate when no MIDI clock is detected.

#### MENU 4.4: LATCH

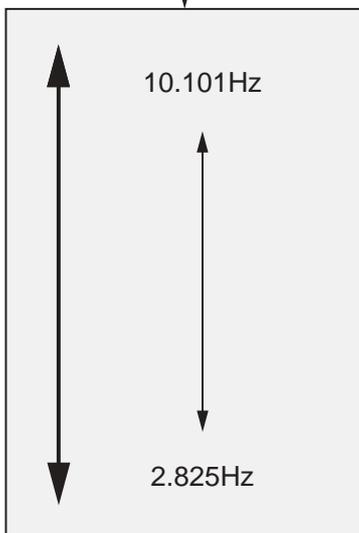
Any notes being played and arpeggiated will be held when you select "Note latch".

You may also select Note latch before you have played any notes. The RS370 will then wait for you to play some notes, and will hold these until the latch is cancelled.

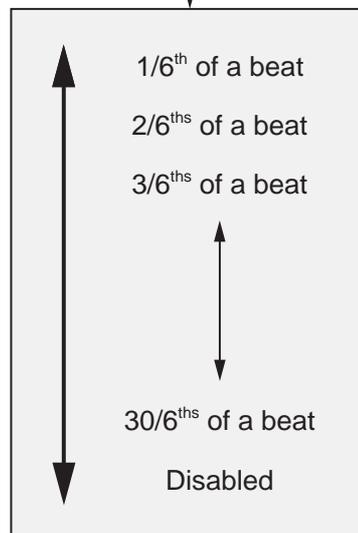
To release the latch but remain in the Note latch menu, press the EDIT knob. A further press of the EDIT knob will then latch the notes again.

To release the latch and to leave this sub-menu, press CANCEL.

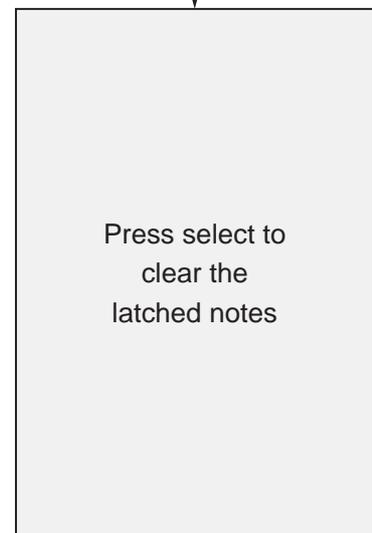
Speed  
(press "EDIT")

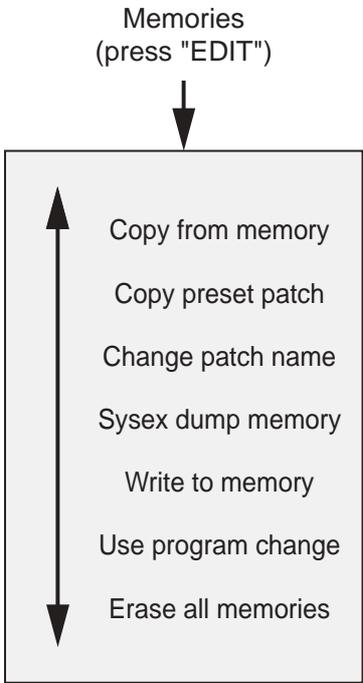


MIDI Sync  
(press "EDIT")



Note latch  
(press "EDIT")





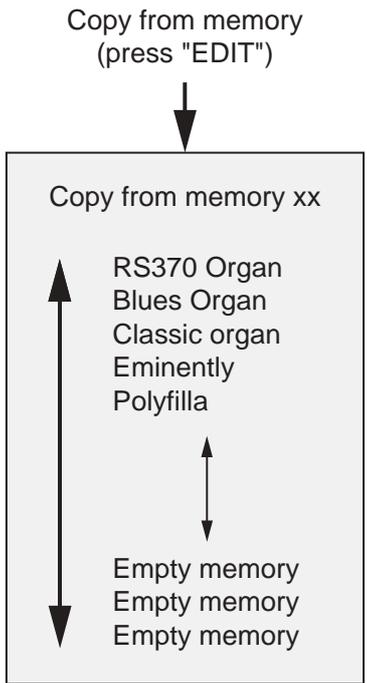
**MENU 5: MEMORIES**

Menu 5 provides access to all the commands needed to organise and manage the forty-six patch memories with the RS370.

**MENU 5.1: COPY FROM MEMORY**

The RS370 offers forty-six patch memories, of which twenty-three are initially populated by factory sounds.

This menu - which is identical to Menu 1 - allows you to select any one of the stored patches and load this into the edit buffer. When you do so, the patch name is displayed at the top of the screen.

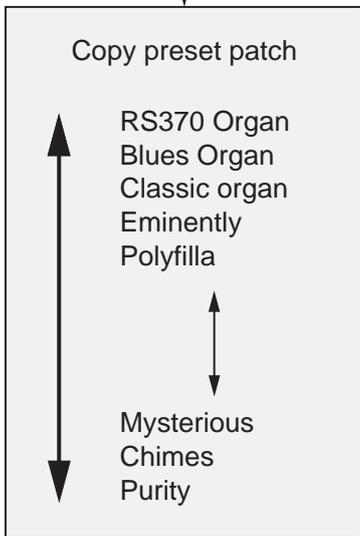


**MENU 5.2:  
COPY PRESET PATCH**

This allows you to select any of the twenty-three factory preset patches and load this into the edit buffer. When you do so, the patch name is displayed at the top of the top level screen.

*Note: The factory sounds are held in ROM and can always be recalled, even when you have overwritten them in the main area of memory.*

Copy preset patch  
(press "EDIT")

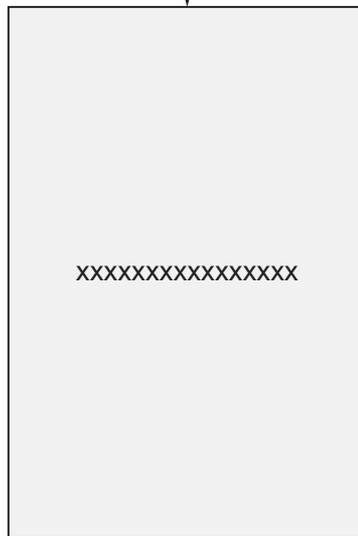


**MENU 5.3:  
CHG PATCH NAME**

Change the name of the patch in the edit buffer.

Navigate left/right using the EDIT knob, then press the knob to permit changes to the highlighted character.

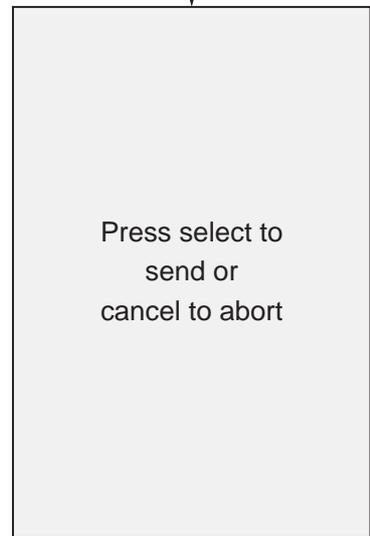
Change patch name  
(press "EDIT")



**MENU 5.4:  
SYSEX DUMP MEMORY**

Press the EDIT knob to dump the patch in the edit buffer to a waiting SysEx recorder.

Sysex dump memory  
(press "EDIT")



### MENU 5.5: WRITE TO MEMORY

You can save the sound in the edit buffer to any of the forty-six patch locations.

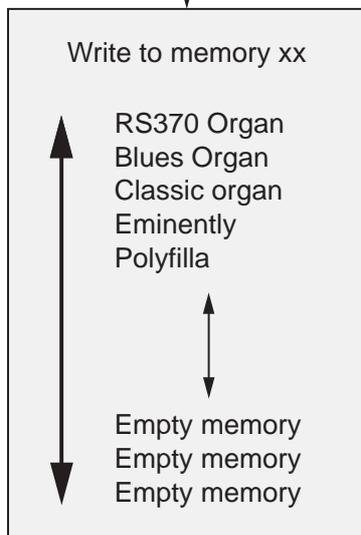
Select the memory to which you wish to save the sound. The RS370 will ask:

Are you sure? NO  
Are you sure? YES

To save, select YES and press the EDIT button.

To abort the operation, press NO or CANCEL.

Write to memory  
(press "EDIT")

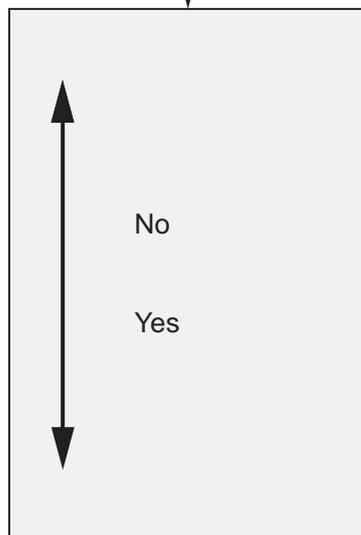


### MENU 5.6: USE PROGRAM CHG

Set this option to "Yes" to permit patch selection using the MIDI Program Change command.

Set it to "No" to disable MIDI Program Changes.

Use program change  
(press "EDIT")



### MENU 5.7: ERASE ALL MEMORIES

Erases all patch memories. If you select this, the RS370 will ask:

Are you sure? NO  
Are you sure? YES

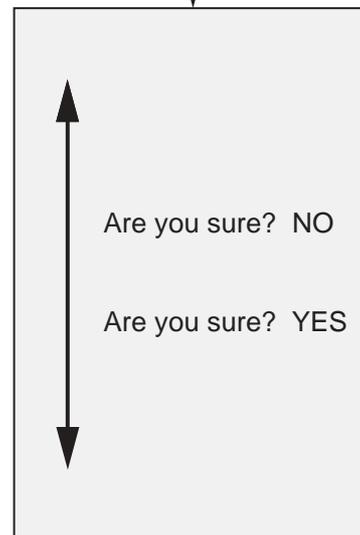
To erase all memories, select YES and press the EDIT button.

To abort the operation, press NO or CANCEL.

#### **Warning:**

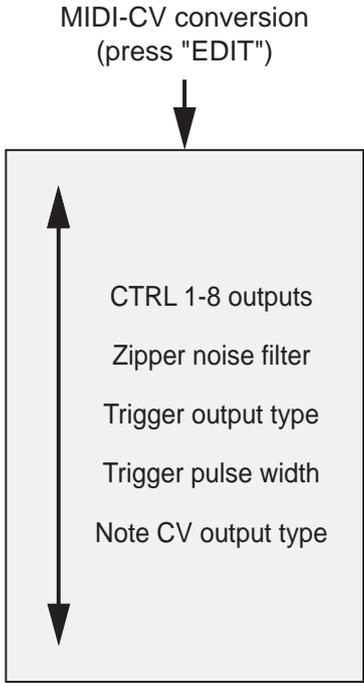
Use this operation with great care. While you can reload the factory sounds (see menu 5.2 and menu 8) you cannot rescue your own sounds unless you have saved them via SysEx (menu 5.4).

Erase all memories  
(press "EDIT")





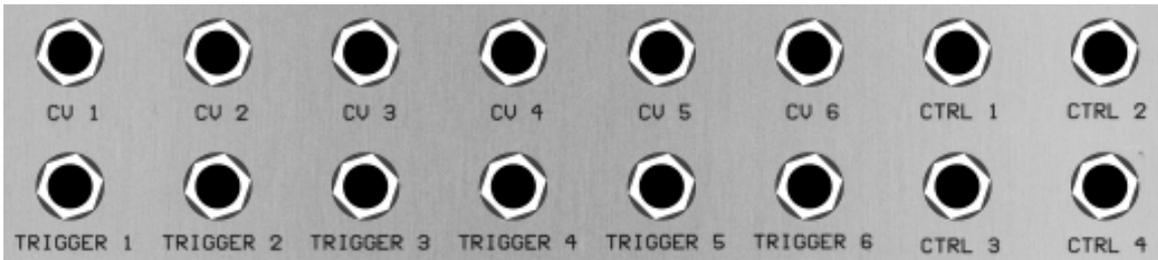
**MENU 6: MIDI TO CV CONVERSION**



The RS370 is a powerful single-channel, 6-note MIDI/CV converter that you can use independent of, or in conjunction with its internal synthesiser. It offers six pitch CVs (V/Oct and Hz/V standards), multiple note allocation modes, plus Triggers, Gates, and S-Triggers, with variable voltage ranges for each.

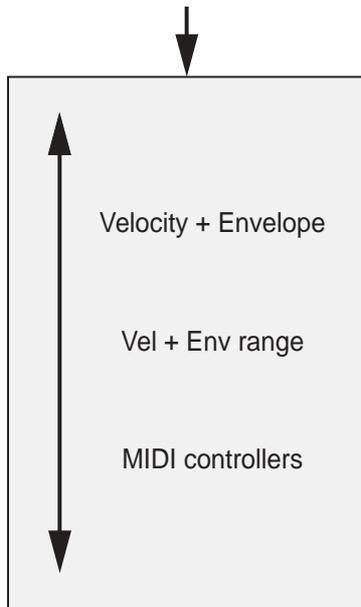
The RS370 provides four MIDI Controller outputs (CTRL1 to CTRL4) that you can allocate freely to more than 130 MIDI performance controllers and CCs. With the RS375 or RS376 Expanders attached, you have access to a further four programmable outputs (CTRL5 to CTRL8).

In addition, you can direct the RS370's internal envelopes to the MIDI CTRL outputs. This means that, in addition to the voltages determined from the MIDI data, you can tap the envelopes triggered by the MIDI Note ONs, directing them back into the RS370 itself in novel ways, or sending them to external modules and/or synthesisers. This is a very powerful feature that allows you to use MIDI/CV triggering in ways that are not possible on any other single module.





CTRL 1-8 outputs  
(press "EDIT")



### MENU 6.1: CTRL 1-8 OUTPUTS

Determines how the MIDI/CV converter operates, and what controllers are available at the CTRLx outputs.

#### 6.1.1 Velocity + Envelope

This determines whether the CTRL1 to CTRL"*n*" outputs carry voltages proportional to MIDI velocity or the signals generated by the RS370's internal envelopes.

##### • What is "*n*"?

The number "*n*", which can take values from 1 to 6, is the number of voices selected in menu 7.4. Depending upon the value of "*n*", menu 6.1.1 determines the signals carried by:

- n*=1: CTRL output 1 alone
- n*=2: CTRL1 & 2
- n*=3: CTRL1, 2 & 3
- n*=4: CTRL1, 2, 3 & 4
- n*=5: CTRL1, 2, 3, 4 & 5
- n*=6: CTRL1, 2, 3, 4, 5 & 6

There are four options:

##### • Disabled

No signals are output

##### • Out1->*n* = Velocity

The CTRL 1-*n* outputs carry the MIDI velocities for the MIDI Note ONs currently being played, up to the maximum number of notes being accepted by the RS370. (See menu 7.4.)

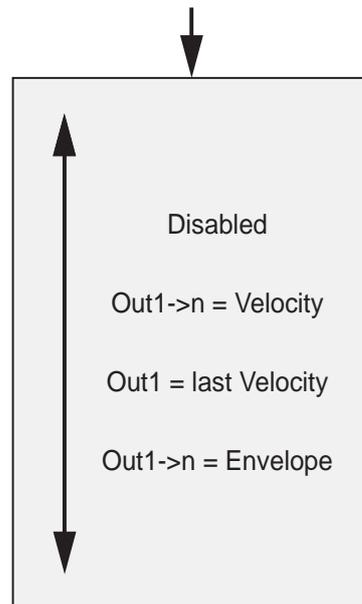
##### • Out1 = last Velocity

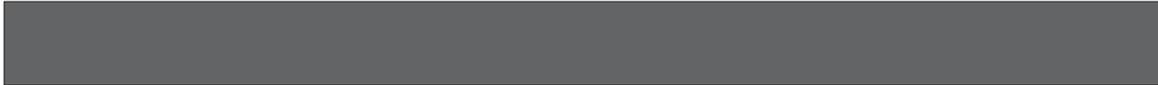
CTRL 1 carries the MIDI velocity of the note most recently played. Use this option when using the RS370 to drive a monophonic synthesiser.

##### • Out1->*n* = Envelope

The CTRL 1-*n* outputs carry the internal envelopes as triggered by the most recent MIDI Note ONs. The maximum number of envelopes produced is determined by the maximum number of voices being generated by the RS370. (See menu 7.4.)

Velocity + Envelope  
(press "EDIT")





**6.1.2 Vel + Env range**

Determines the output voltage range for the MIDI velocities or envelopes selected in menu 6.1.1. The options are:

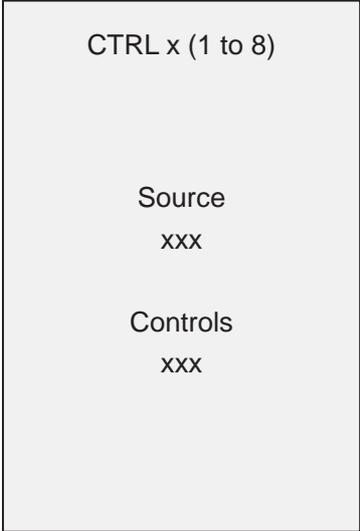
- -10v to +10v
- -5v to +5v
- 0v to +10v
- 0v to +5v

**6.1.3 MIDI Controllers**

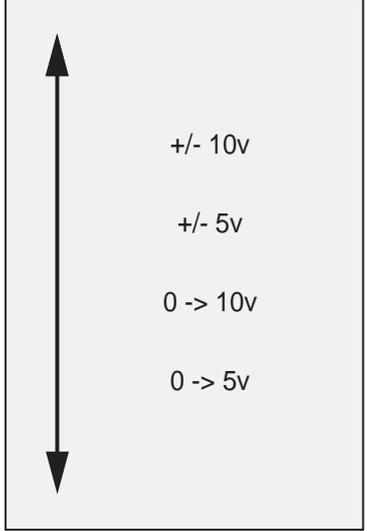
Determines the signals carried by any CTRL outputs not occupied by the MIDI Velocity and Envelope settings in menus 6.1.1 and 6.1.2.

- **Source**  
There are 130 MIDI controller sources. Select one for each CTRL output that you wish to use.
- **Voltage range**  
Select the voltage range generated by each of the used CTRL outputs.

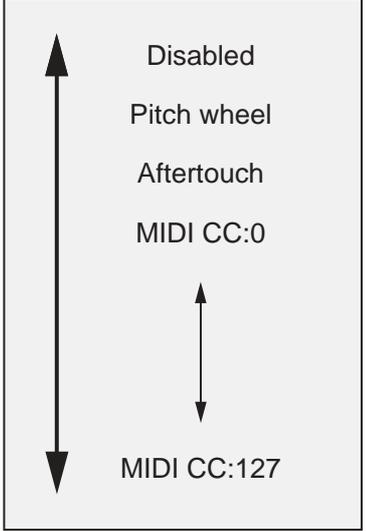
MIDI controllers (press "EDIT")



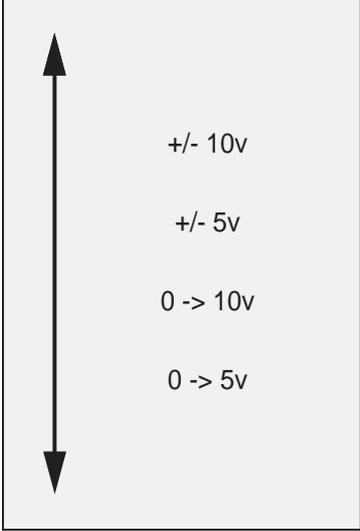
Vel + Env range (press "EDIT")



Source (press "EDIT")



Voltage range (press "EDIT")

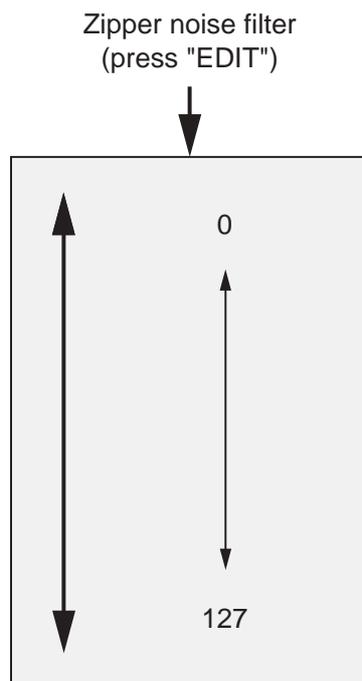


## MENU 6.2 ZIPPER NOISE FILTER

There is a low-pass filter (a slew generator) placed between the MIDI/CV converter and the outputs. This smoothes the analogue CVs produced, and eliminates "zipper noise" caused by the 7-bit quantisation of MIDI control values.

Select a value that eliminates the 'zipper noise' artefact without unduly slowing the response that you require.

- zero = no filtering
- 127 = maximum filtering



## MENU 6.3 TRIG OUTPUT TYPE

Select between the conventional trigger and gate types, and obtain these from the RS370's six trigger outputs.

### • Trigger

Each MIDI Note On produces a Trigger pulse (defined by menu 6.4) of approximately +5v at the appropriate output.

### • Gate

Each MIDI Note On produces a Gate of approximately +5v at the appropriate output while the key remains depressed.

### • S-Trig

Each MIDI Note On produces an S-Trig (an inverted Gate) of approximately 5v->0v at the appropriate output.

### • Mixed triggers

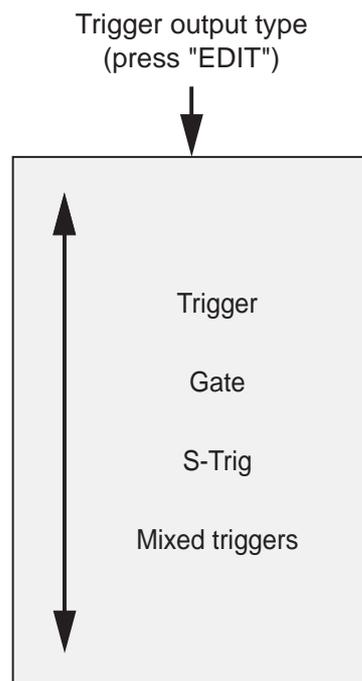
Every Trigger or Gate generated by a MIDI Note On is directed to all six of the Trigger outputs simultaneously.

### *About Mixed triggers:*

*In the late 1970s and early 1980s, there were a handful of polyphonic synthesizers manufactured that offered just a single filter and filter envelope for the whole keyboard, no matter how many notes were pressed.*

*In this limited architecture, there were two ways to make the filter envelope respond to someone's playing. Firstly, the filter envelope could react (i.e. enter the Attack stage) when the first note was played, and only enter its Release stage when the last note was released. Alternatively, every new note could reinitialise the envelope. This made it possible to "chop" up your playing, causing every note to retrigger each time that you played a new note.*

*The RS370's "Mixed triggers" option - which is perhaps unique on an instrument in the modern era - recreates the latter response.*

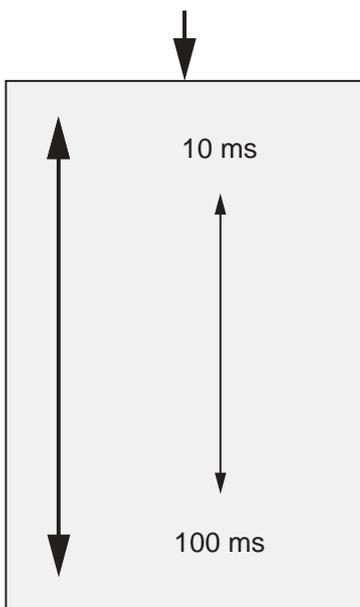


## MENU 6.4 TRIG PULSE WIDTH

With the Trigger option selected in menu 6.3, this allows you to determine the duration of the trigger pulse.

For correct operation, this should be set to the shortest duration that triggers the destination.

Trigger pulse width  
(press "EDIT")



## MENU 6.5 NOTE CV OUT TYPE

The RS370 will control analogue synthesisers that conform to both of the common pitch/voltage standards:

- **1v/octave**

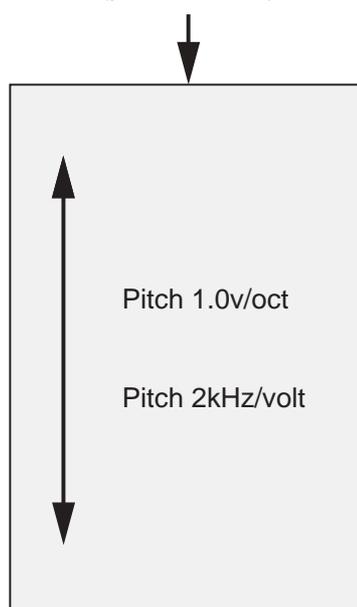
Use this option to control the pitch on synthesisers from manufacturers such as Moog, ARP, Sequential Circuits, Roland and Analogue Systems.

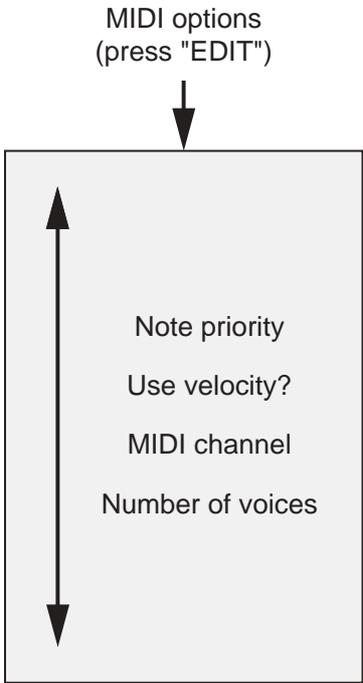
- **2kHz/volt**

Use this option to control the pitch on some of the vintage synthesisers produced by Korg and Yamaha.

*If you are unsure of the appropriate option to use, please consult the documentation for the destination system.*

Note CV output type  
(press "EDIT")





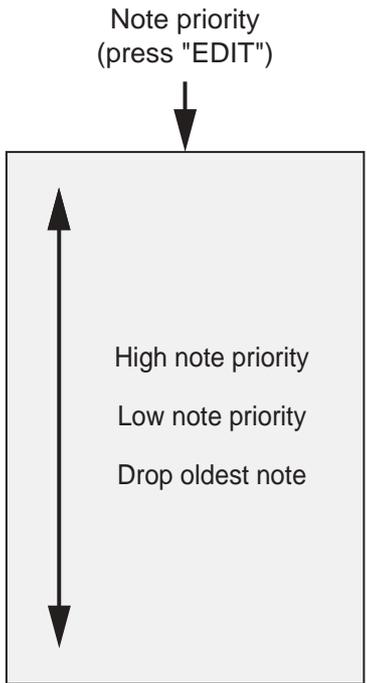
**MENU 7: MIDI OPTIONS**

This menu allows you to set up global parameters that determine how the RS370 responds to incoming MIDI data.

**MENU 7.1: NOTE PRIORITY**

If you play more notes than the RS370 is able to reproduce simultaneously, you must choose how the unit responds to the next note received. This is particularly relevant when using the RS370 as a monophonic synthesiser.

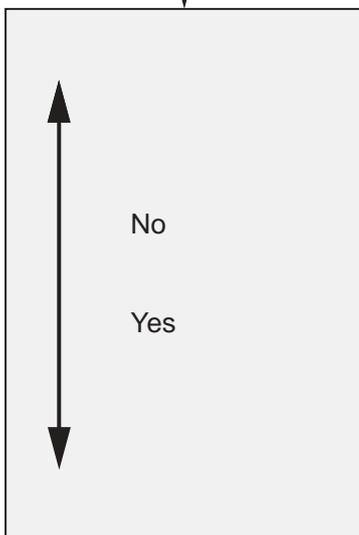
- High note priority  
High notes are prioritised, and lower ones are 'stolen' so that high ones can be produced.
- Low note priority  
Low notes are prioritised, and higher ones are 'stolen' so that low ones can be produced.
- Drop oldest note  
Recent notes are prioritised, and older ones are 'stolen' so that current ones can be produced.



### MENU 7.2 USE VELOCITY

Switches On and Off the RS370's response to MIDI Velocity

Use velocity  
(press "EDIT")

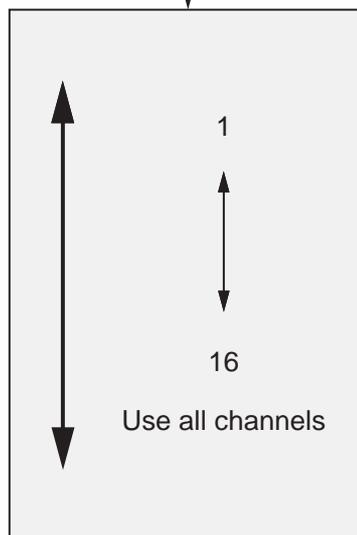


### MENU 7.3 MIDI CHANNEL

• **1 - 16**  
Select the MIDI channel received.

• **Use all channels**  
The RS370 responds to all incoming MIDI data (OMNI mode).

MIDI channel  
(press "EDIT")



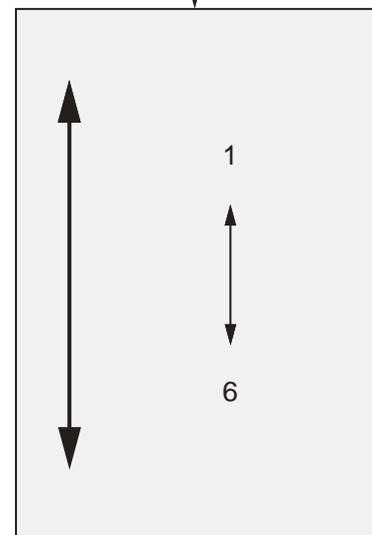
### MENU 7.4 NUMBER OF VOICES

This performs two functions simultaneously:

• **Synthesiser voices**  
Determines the number of voices produced by the RS370's internal synthesiser.

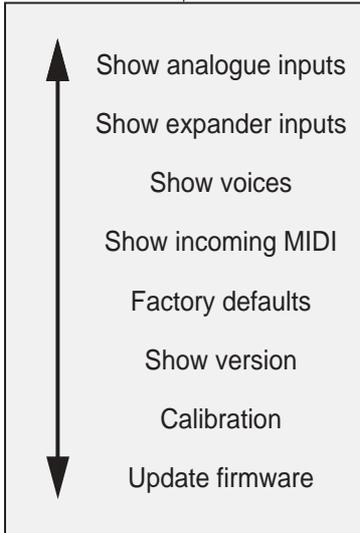
• **MIDI/CV voices**  
Determines the number of voices handled by the MIDI/CV converter, whether used to drive the internal synthesiser, or to drive external devices.

Number of voices  
(press "EDIT")





Special options  
(press "EDIT")



### MENU 8: SPECIAL OPTIONS

These options provide all the "housekeeping" functions for the RS370. They allow you to observe the operation of the RS370 (and, if connected) the RS375 Expander, to calibrate them, update their operating system, and restore the factory defaults.

### MENU 8.1 SHOW ANALOGUE IN

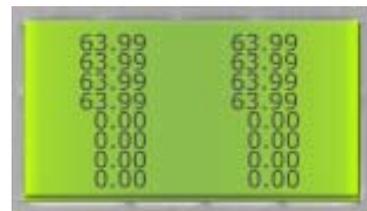
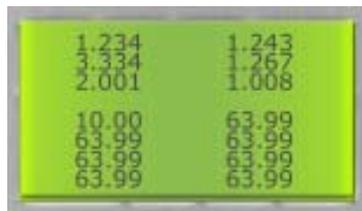
This page shows fourteen values.

- **CV inputs/outputs**  
The block of six values shows the voltages present at the CV1 to CV6 sockets, whether used as inputs or outputs.

- **CTRL inputs**  
The block of eight values shows the input voltages at CTRL IN 1 to CTRL IN 8.

### MENU 8.2 SHOW EXPANDER IN

This page shows the voltages produced by the sixteen knob/ input pairs (denoted as HARM 1 to HARM 16) on the RS375 Expander.



### MENU 8.3 SHOW VOICES

This page shows the status of the internal voices.

The values shown are:

- MIDI note number
- Current envelope stage

The symbol "\_" denotes that this voice is currently unused or inactive.

The bar to the right of the screen shows the summed output amplitude of all voices being played.



### MENU 8.4 SHOW MIDI

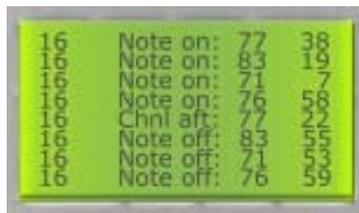
Shows the eight most recent MIDI messages received by the RS370. The first two values shown are:

- The MIDI channel received
- The message type

The next two values depend upon the message type. For example, if the message is a Note On or Note Off, the values will be:

- MIDI Note number
- Note On (or Off) Velocity

*For a full description of MIDI messages and their values, please refer to an appropriate text.*



### MENU 8.5: FACTORY DEFAULTS

The RS370 ROM contains the factory defaults, including the factory sounds. If you wish to restore these, select this menu and press EDIT. The RS370 will ask:

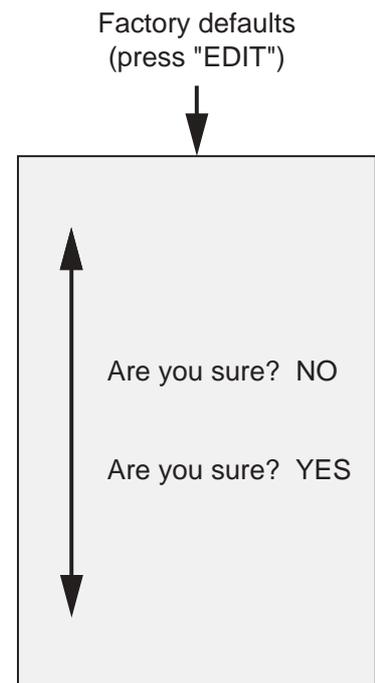
Are you sure? NO  
Are you sure? YES

To restore the defaults, select YES and press EDIT.

To abort the operation, press NO or CANCEL.

**Warning:**

*Use this operation with great care. You cannot rescue your own sounds and settings after restoring the factory defaults.*



## MENU 8.6 SHOW VERSION

Shows the software version installed, and the date of this version.



## MENU 8.7 CALIBRATION

You may calibrate the CV outputs on your RS370 (and, if connected, the CV/control inputs on your RS375).

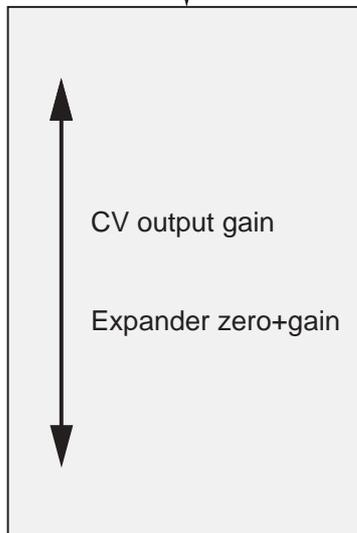
There are two options:

- Calibrate the RS370 CV output gains
- Calibrate the RS375 Expander zero and gain

**Warning:**

*If you are unsure about calibrating your units, please leave this for qualified personnel at Analogue Systems, or at the company's appointed dealers and service agents.*

Calibration  
(press "EDIT")



### 8.7.1 Calibrating RS370 CVs

To calibrate the RS370's CV outputs, select "CV output gain".

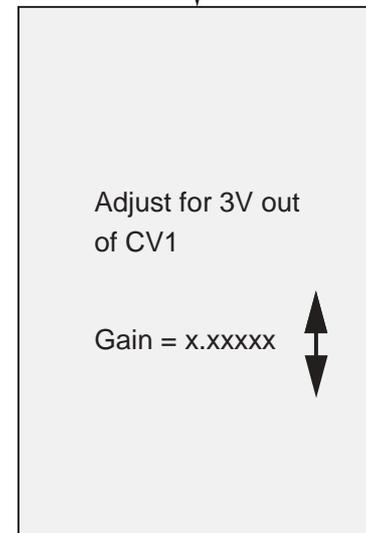
Measure the voltage produced by the CV1 socket using a high accuracy voltmeter. Use the EDIT knob to adjust the Gain shown on the RS370 screen until the output voltage is precisely 3v.

Now press EDIT.

The unit will display the message "Please wait" for a moment while it performs internal calibration of the CVs.

**Do not touch any of the controls while this is happening.**

CV output gain  
(press "EDIT")



### 8.7.2 Expander zero + gain

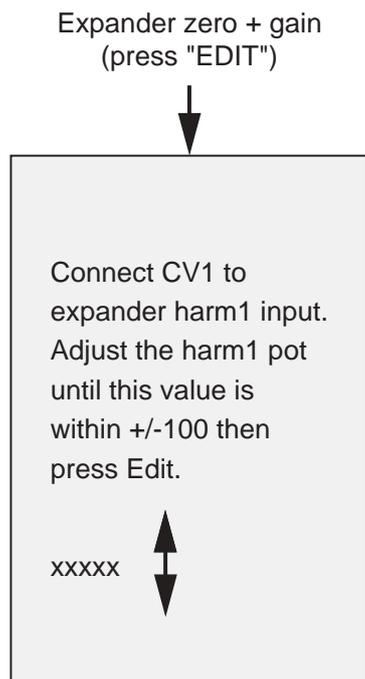
To calibrate the RS375's CV outputs, select "Expander zero+gain".

Remove all MIDI connections from the RS370. Connect the correctly calibrated CV1 output on the RS370 to the HARM1 input on the RS375, and use the HARM1 knob to obtain a value as close to zero as possible.

Now press EDIT.

The unit will now calibrate for 0V and calibrate the internal CV gain.

**Do not touch any of the controls while this is happening.**



### Warning:

If the RS375 fails to calibrate, and/or you obtain the message, "Unable to calibrate expander input gain" ensure that the patch cable has good continuity and try the operation again. If calibration still fails, contact Analogue Systems for advice.

***Under no circumstances must you attempt to fault-find as:***

- *it can be dangerous to you*
- *it may harm the unit*
- *it will void your warranty*

### MENU 8.8 UPDATE FIRMWARE

You may update the RS370 firmware (i.e. the operating system) via MIDI.

To update, select YES and press the EDIT button. The RS370 will then wait for the data. If you are unable to send the OS file or a fault occurs, the RS370 will continue to wait. You cannot CANCEL this, and if you remain unable to send the upgrade, power cycle the unit (i. e. switch Off and then switch On again). This will not harm the RS370, which will remain unaffected by the aborted upgrade.

If you decide not to upgrade, select NO or press CANCEL.

