THONK SYNTH tO8 DOUBLE BUBBLE

INTRODUCTION

DOUBLE BUBBLE is a 16HP dual multi-mode Eurorack filter designed for flexible signal processing and creative modulation. Each channel features an analog filter core that can operate in one of four modes - **Low-Pass, High-Pass**, **Band-Pass**, or **Notch**.

The two channels can run independently, be linked for stereo operation, or arranged in serial configuration for more complex signal paths. This flexibility allows the module to cover a wide range of roles, from precision cascading filter patches to dynamic stereo filtering and experimental feedback processing.

The ***SPACING*** control lets you steer both filters in opposite direction with a single knob, while the ***FEEDBACK*** and ***XMOD*** (cross-modulation) controls add further interaction between the two channels, ranging from subtle harmonic enhancement to more extreme, self-modulating textures.

A wide range of CV controls give deep modulation possibilities. Dedicated ***V/OCT*** inputs let either channel track pitch accurately, allowing the filters to function as oscillators or tone sources when self-oscillating.

DOUBLE BUBBLE is designed to be an adaptable sound-shaping tool - equally comfortable handling traditional filter duties or exploring more experimental feedback and modulation techniques.

SPECS

Width 16HP

Depth 38mm (including power connector)

Current +12V 102mA / -12V 67mA / +5V 0mA

Input levels 10Vpp

Output levels 10Vpp

CV input levels -10V to +10V

QUICK GUIDE

1. ***LARGE FREQUENCY KNOBS -*** The main frequency controls for each channel. Ranges from 20Hz - 20KHz.

2. ***LINK SWITCH -*** When enabled, Channel A's large ***FREQUENCY*** knob also controls Channel B's frequency. The LED will be lit when enabled.

3. ***SPACING KNOB & CV INPUT -*** Controls the spread between the two filters, moving each cutoff in an opposite direction. When you patch into the ***SPACING CV*** input, the knob becomes an attenuverter for the incoming CV signal. The range for the CV is -10V to +10V.

4. ***RESONANCE KNOBS -*** Adjusts the resonance for each channel.

5. ***XMOD (CROSS-MOD) KNOBS & CV INPUT -*** Modulates the cutoff frequency of one channel with the audio output of the other channel. When you patch into the ***XMOD CV*** input, each knob becomes an attenuator for the incoming CV signal. The range for the CV is 0V to +5V.

6. ***MODE SWITCH -*** Selects between the four filter modes for each channel. The LEDs indicate the selected mode.

7. ***FEEDBACK KNOB & CV INPUT -*** Mixes ***OUT B*** back into ***IN A***. When you patch into the ***FEEDBACK CV*** input, each knob becomes an attenuverter for the incoming CV signal. The range for the CV is 0V to +5V.

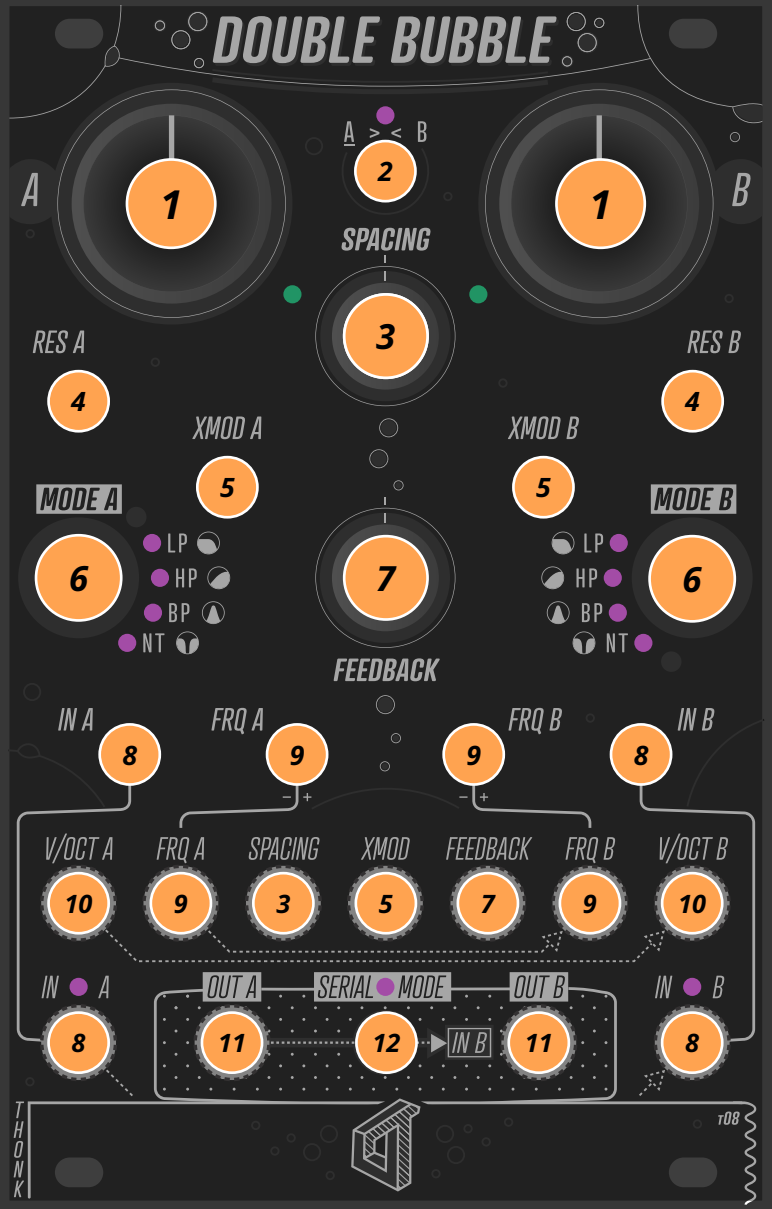
8. ***INPUTS & LEVEL CONTROL -*** The signal inputs for each channel. Set the level with the ***LEVEL*** control. The LEDs act as clipping warning indicators.

9. ***FREQ CV & ATTENUVERTER -*** CV inputs and attenuverters for the cutoff frequency. Accepts -10V to +10V.

10. ***V/OCT CV -*** Direct frequency CV input that tracks to 1V per octave. If you don't specifically need V/Oct accuracy, this also operates as a secondary cutoff frequency CV input.

11. ***OUTPUTS -*** The signal output for each channel.

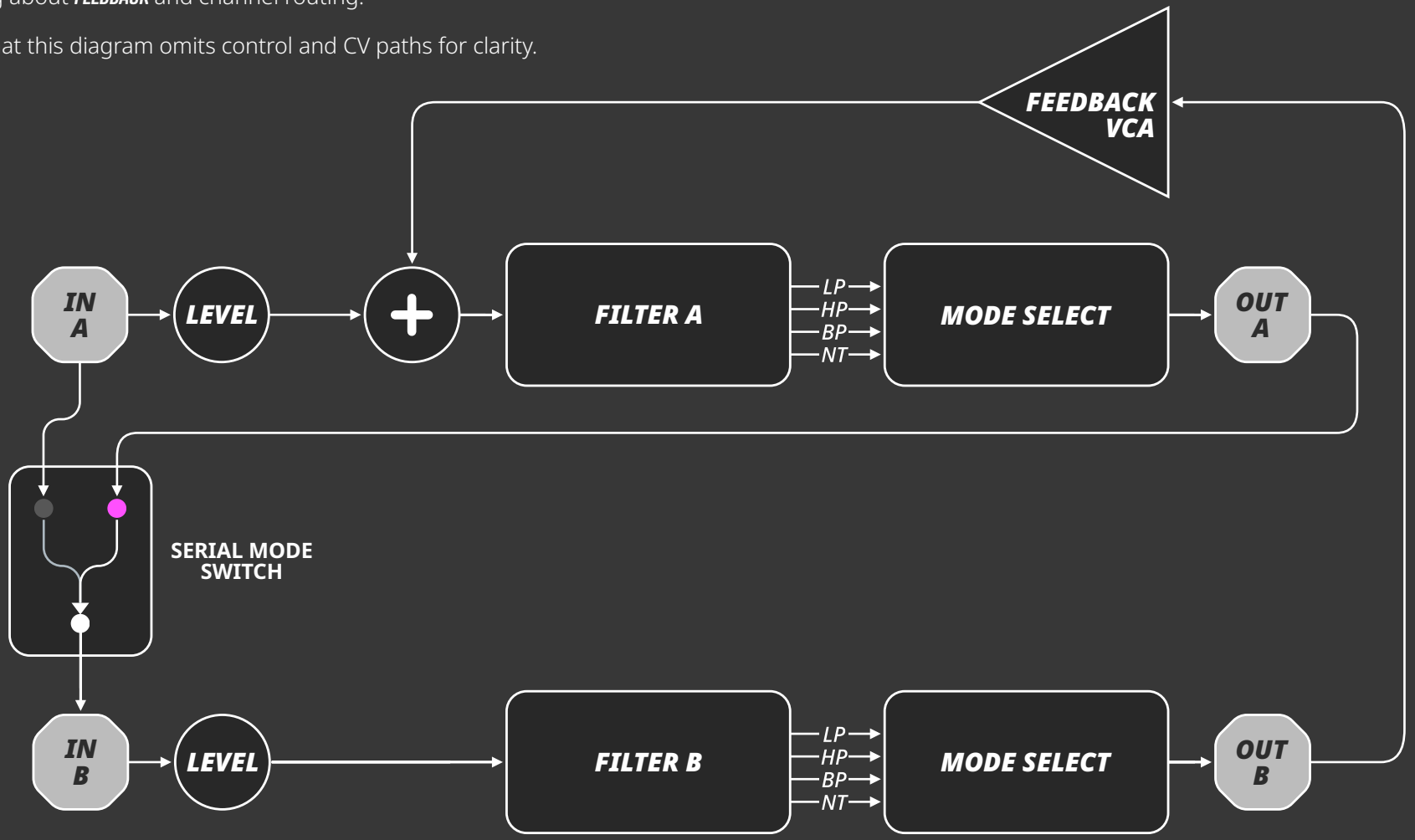
12. ***SERIAL MODE BUTTON -*** When enabled, ***OUTPUT A*** is sent directly to ***INPUT*** B. When disabled, a copy of ***INPUT A*** is sent to ***INPUT B.***



BLOCK DIAGRAM

This block diagram shows a simplified view of the signal flow in ***DOUBLE BUBBLE***. It focuses on the essential audio paths - showing how the signal flow changes when when the module is set to ***SERIAL MODE***. Use it as a quick reference while reading about ***FEEDBACK*** and channel routing.

Note that this diagram omits control and CV paths for clarity.



INPUTS & ROUTING

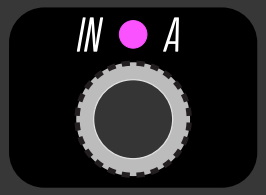
Each channel has its own ***LEVEL*** control, labelled ***IN A*** and ***IN B***. Use these controls along with the ***INPUT LEDs*** to help you set the levels for each channel.

INPUT LEVELS

ⓘ As a general guide, set the ***LEVEL*** control so that the peaks of your signal push the LED briefly into its brighter range - this will give you a strong, dynamic signal without clipping.

Turning the ***LEVEL*** control clockwise increases the input level and drives the filter harder, introducing asymmetrical soft clipping for a warmer, more saturated tone. Turning it back reduces the input level, giving a cleaner response and leaving more headroom for hot signals.

INPUT LEDS



Each ***INPUT LED*** can be thought of as a ***'clipping warning'*** indicator. At normal levels, the LED will light up dimly in response to incoming audio - as you turn the ***LEVEL*** control up, the LED will light up brighter as the filter core gets close to clipping. As you keep increasing the ***LEVEL*** control, the LED will start to remain brightly lit - indicating that the channel is now clipping.

The input level has a noticeable effect on the filter's character. At higher levels, the core begins to compress and the resonance becomes less pronounced - you may need to increase the resonance control to reach the same intensity.

When using the ***FEEDBACK*** knob or CV, keep in mind that feedback gain adds to the input level, so it's easy to push the filter into clipping. Depending on your settings and tastes, this can range from subtle coloration to heavy distortion.

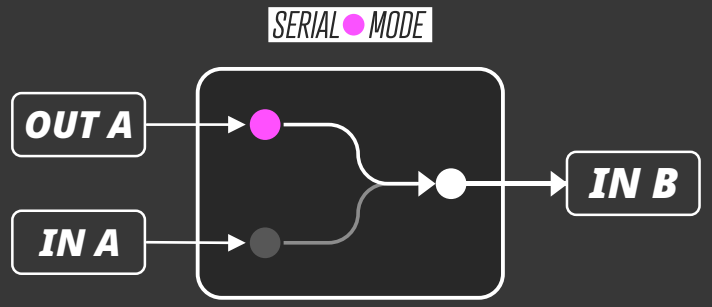
SERIAL MODE

The ***SERIAL MODE*** button controls the routing of the two channels, allowing both serial and parallel routing. When enabled, the LED will light up and ***OUT A*** will be routed into ***IN B***.

You will find the patch example on **page 17** is a good demonstration of how ***SERIAL MODE*** works, and the patch example on **page 16** will show you how you can use PARALLEL routing.

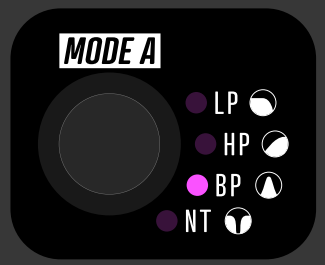
With ***SERIAL MODE*** enabled, the signal sent into ***IN A*** goes through ***CHANNEL A*** first, then through ***CHANNEL B***. This can have different results depending on the mode setting of each channel, for example **low-pass** into **high-pass** can give you a variable width **band-pass** filter, or you can get phaser effects by setting both channels to **notch** mode.

With ***SERIAL MODE*** disabled, ***IN B*** is fed a copy of ***IN A***. This can be thought of as parallel processing, where each channel is completely separate, especially useful for creating a stereo signal from a mono source.



ⓘ The ***SERIAL MODE*** button only effects the normalisation of the ***IN B*** jack. As soon as you patch a signal into ***IN B***, you are overriding the routing and the ***SERIAL MODE*** button will have no effect.

FILTER MODES



DOUBLE BUBBLE allows you to set each channel's mode independently.

ⓘ **TAP** the ***MODE*** button to step through each filter response.

ⓘ **HOLD** the ***MODE*** button to go back one step.

The four available modes are:

LOW PASS
4 pole
-24dB/oct

HIGH PASS
2 pole
-12dB/oct

BAND PASS
2 pole
-12dB/oct per side

NOTCH
-40dB typical

DID YOU KNOW??

DOUBLE BUBBLE uses the SSI2140 as its filter core - a chip based on the legendary SSM2040 used in countless classic analog synths.

RESONANCE COMPENSATION

In many classic filter designs, as you increase resonance, the pass-band (remaining signal) starts to get attenuated, causing you to lose bass frequencies at higher resonance levels. To counter this, ***DOUBLE BUBBLE*** includes optional RESONANCE COMPENSATION when in ***LP*** mode. When enabled, the low-frequency content is preserved as resonance is increased, maintaining consistent perceived level and bass response.

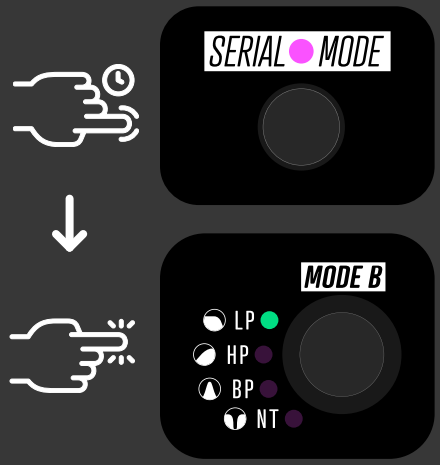
RES COMP is a personal choice - sometimes it maintains clarity, other times you might prefer the natural roll-off of an uncompensated response. It's turned off by default, and can be toggled on or off independently per channel.

ⓘ To enable RES COMP:

1. PRESS and HOLD the ***SERIAL MODE*** button - you will see both channel's ***LP*** LED start to pulse.
2. TAP the ***MODE*** button for the channel you wish to enable the setting for.
3. The ***LP*** LED changes from PINK to GREEN, indicating that RES COMP is active for that channel.

To disable it again, PRESS and HOLD the ***SERIAL MODE*** button, and press the ***MODE*** button once more - the LED returns to PINK.

While the ***SERIAL MODE*** buttons being held and the ***LP*** LEDs are pulsing, you can press the ***MODE*** button repeatedly to toggle RES COMP on and off quickly, allowing you to audition the sound. If you are NOT currently in ***LP*** mode, toggling RES COMP will force that channel into ***LP*** mode immediately.



FREQUENCY CONTROLS

DOUBLE BUBBLE has a number of ways to interact with the cutoff frequency, some of which are independent for each channel and others which have an effect on both channels simultaneously. All these frequency controls have CV inputs allowing you to modulate each channel's cutoff frequency in a number of ways.

LARGE FREQUENCY KNOB

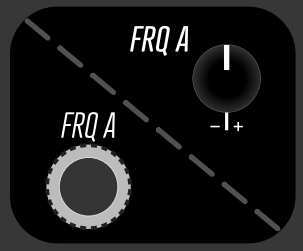
The large ***FREQUENCY*** knob is the main cutoff frequency control for each channel. This knob sets the base cutoff frequency around which all the other controls and CV inputs are based. With all other controls zeroed the large ***FREQUENCY*** knob spans from 20Hz to 20KHz.

LINK SWITCH

When the ***LINK*** switch is engaged, its LED lights up and the large ***CHANNEL A FREQUENCY*** knob controls the cutoff for both channels. In this mode, the large ***CHANNEL B FREQUENCY*** knob will be ignored. This is especially useful when using the filter in stereo, allowing you to sweep the cutoff of both channels with just one control.

Only the large ***CHANNEL B FREQUENCY*** knob is affected by ***LINK*** - all other controls and CV inputs remain operational and independent.

FREQUENCY CV



The ***FREQUENCY CV*** input lets you modulate the cutoff of each channel using control voltage. Each input is summed with the value set by the large ***FREQUENCY*** knob. Depending on your base cutoff, you may reach the upper or lower limits of the filter's frequency range when combining high modulation levels

For example, patching a unipolar envelope to the ***FREQUENCY CV*** input makes the envelope open the filter from the point set by the large ***FREQUENCY*** knob. Patching a bipolar LFO will swing the cutoff above and below that point.

Each channel includes an attenuverter for its ***FREQUENCY CV*** input, allowing you to scale and invert the modulation. When nothing is patched into the ***CHANNEL B FREQUENCY CV*** input, the signal from ***CHANNEL A*** is normalised to ***CHANNEL B***, letting you modulate both channels together with one CV source. The attenuverters act independently, so you can set different modulation depths or polarities for each channel.

These inputs accept -10V to +10V, and when the attenuverter is fully clockwise track to 1 V/Oct.

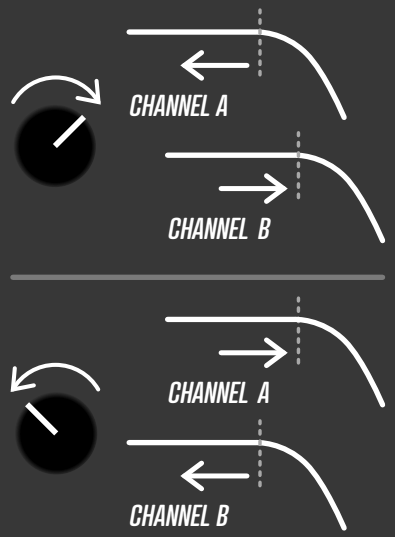
FREQUENCY CONTROLS continued..

SPACING KNOB

The ***SPACING*** control sets how far apart the two filter channels are from each other - it's a single knob that can control movement, width, and interaction between both channels. In a stereo low-pass patch it can feel like a steering wheel that pans the filtering motion from side to side, while in parallel mode it can shape the vocal-style formant filter effect of two closely aligned band-passes.

It offsets the cutoff frequencies of ***CHANNEL A*** and ***CHANNEL B***, moving them in opposite directions around their current frequency settings. You can think of this as turning the large ***CHANNEL A FREQUENCY*** knob one way and the large ***CHANNEL B FREQUENCY*** knob the other way at the same time.

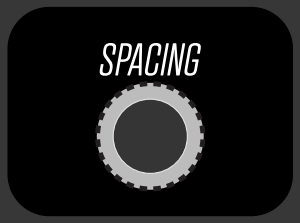
- At the centre (12 o'clock), the control is zeroed and has no effect.
- Turning the ***SPACING*** knob clockwise from centre adds a **positive** offset to ***CHANNEL B*** and a **negative** offset to ***CHANNEL A***.
- Turning it anti-clockwise adds a **positive** offset to ***CHANNEL A*** and a **negative** offset to ***CHANNEL B***.



When the ***LINK*** switch is engaged, the large ***CHANNEL A FREQUENCY*** knob still sets the base cutoff for both channels, while ***SPACING*** moves their frequencies apart - ideal for adding width in stereo patches.

See the patch examples at the end of this manual for more uses of this control.

SPACING CV INPUT



When a signal is patched into the ***SPACING CV*** input, the ***SPACING*** knob functions as an attenuverter, allowing you to scale or invert the incoming modulation.

The input accepts control voltages in the range of –10 V to +10 V. Again, when combined with other CV sources and the position of the large ***FREQUENCY*** knobs, it's possible to reach the full frequency range of the filter core.

FREQUENCY CONTROLS continued..

V/OCT INPUT

Each channel also includes a dedicated, un-attenuated ***V/OCT CV*** input. This input responds exactly like the ***FREQUENCY CV*** input but maintains precise tracking for use with keyboard or sequencer control.

Again like the ***FREQUENCY CV*** input, the ***CHANNEL A V/OCT*** signal is normalised to ***CHANNEL B***.

XMOD (CROSS MODULATION)

XMOD KNOBS

The ***XMOD*** controls introduce interaction between the two filters, using each one's audio output as a modulation source for the other. Subtle amounts can add fizz and texture to the sound, while higher amounts can push each channel into unpredictable chaos.

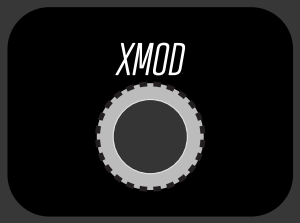
They are fun controls to experiment with for any kind of patch, whether you have mono, stereo or completely separate signals. They will have a very immediate effect, and can often change the sound quite drastically.

XMOD A controls how much ***OUT B*** modulates ***FREQUENCY A***, while ***XMOD B*** controls how much ***OUT A*** modulates ***FREQUENCY B***. Each ranges from zero modulation to full-scale modulation, where the full signal of one channel modulates the opposing channel.

ⓘ A useful way to explore their effect is to leave both inputs unpatched, increase the resonance until both filters self-oscillate, and set the large ***FREQUENCY*** knobs to a comfortable level. Listen to the ***CHANNEL A's*** output while gradually raising ***XMOD A*** - you'll hear ***CHANNEL B*** modulating ***CHANNEL A's*** frequency. This behaves just like FM synthesis, with ***CHANNEL A*** acting as the carrier and ***CHANNEL B*** as the modulator. Listen to how changing the large ***FREQUENCY B*** knob and ***XMOD A*** effects the sound.

Try increasing ***XMOD B*** to hear how even small changes to either channel's ***FREQUENCY*** or ***XMOD*** settings can dramatically change the resulting tone, and how when both channel's ***XMOD*** controls used together things can get quite chaotic.

XMOD CV INPUT



The ***XMOD CV*** input allows you to modulate the overall amount of cross-modulation between both channels. It is shared for both ***XMOD A*** and ***XMOD B***. When a CV signal is present, the ***XMOD A*** and ***XMOD B*** knobs act as attenuators for the incoming control voltage, letting you scale each channel's modulation depth independently.

The ***XMOD CV*** input accepts 0V to +5V, where 0V equals no cross-modulation and +5V produces maximum modulation depth.

FREQUENCY LED INDICATORS

Because there are many ways to control and modulate the cutoff frequency, each channel includes a frequency indicator LED that shows the **MOVEMENT** of that frequency in real time. The LEDs respond to any **CHANGE** in cutoff frequency, and will show the direction and speed of the movement.

- When a channel receives a positive change in frequency, the LED lights PINK .
- When it receives a negative change, the LED lights GREEN.
- When the movement stops, the light fades out smoothly.
- Faster movements will mean the LED will be brighter.

These are a useful tool to understand what each frequency control does - now is a great point to take some time trying out each frequency control and CV input while observing the ***FREQUENCY LED***.

You will notice how when using the ***SPACING*** knob, each channel moves in an opposite direction.

You can also see that when when engaging the ***LINK*** button, **BOTH** channels now follow the movement of the large ***CHANNEL A FREQUENCY*** knob.

At fast modulation speeds - for example, when using the ***XMOD*** knobs or audio-rate CV sources - the LEDs alternate quickly between pink and green, so they appear more as a white/blue colour. This gives you instant visual confirmation of audio-rate modulation or fast movements taking place within that channel.

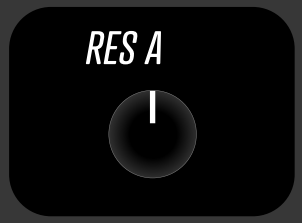
POSITIVE movement on CHANNEL A

NEGATIVE movement on CHANNEL B

AUDIO-RATE movement on BOTH channels

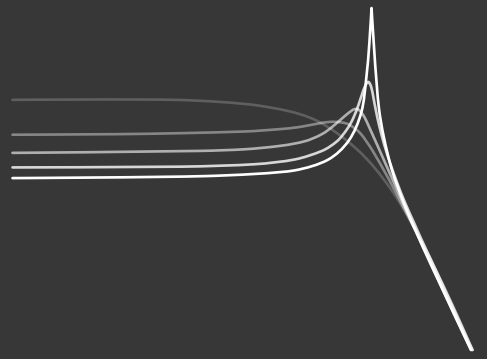
RESONANCE CONTROLS

RESONANCE KNOB



The ***RES*** knobs control the amount of resonance for each channel, boosting frequencies around the cutoff point to create a resonant peak. With the knob fully counter-clockwise, there will be no resonance. As you increase the control, more resonance is introduced - past 3 o'clock it can become quite pronounced.

The overall amount of audible resonance depends heavily on the input level. At lower input levels, resonance becomes apparent earlier in the knob's range. When the filter is being driven hard, you'll need to turn the ***RES*** knob further to achieve a similar effect.



With no signal patched to the input, turning the ***RES*** knob past 3 o'clock will cause the filter to self-oscillate, allowing each channel to function as an independent voltage-controlled oscillator. The oscillation frequency is set by the large ***FREQUENCY*** knobs, the ***SPACING***, ***FREQ CV***, and ***V/OCT*** controls.

Try experimenting with different filter modes - each mode has its own self-oscillation character thanks to the pole-mixing topology of the filter core. As noted in the ***XMOD*** section, the cross-modulation controls can also be used during self-oscillation to create a range of FM-style tones.

RESONANCE COMPENSATION

DOUBLE BUBBLE provides optional resonance compensation, which counteracts the loss of bass frequencies when running at high resonance levels.

It can be enabled independently per channel - you can read about how in the **FILTER MODE** section of this manual on **page 5**.

FEEDBACK

DOUBLE BUBBLE features a ***FEEDBACK*** VCA which can be used to emphasise frequencies, add controlled distortion, or push the circuit into self-oscillation. It works by mixing a copy of ***CHANNEL B's*** output back into ***CHANNEL A's*** input. This feedback path can also be inverted which can produce very different results.

Depending on the mode, input level, resonance, and cutoff frequency of both channels, the feedback path can produce a wide range of tones - from a gentle EQ lift or added harmonics to complex, unstable modulation, glitching, or distortion. Try experimenting with different combinations of channel modes and feedback polarity to shape both tone and dynamics.

The circuit behaves quite differently depending on the routing mode, set by the ***SERIAL MODE*** button:

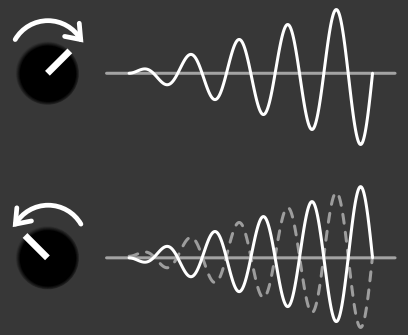
- With ***SERIAL MODE*** disabled, because ***CHANNEL B*** is fed from ***CHANNEL A's*** input, the feedback path never forms a complete loop. In this configuration feedback acts more like an active tone-shaping stage, adding harmonics, saturation or even phase cancellation.
- When ***SERIAL MODE*** is enabled, ***CHANNEL B*** is fed from ***CHANNEL A's*** output, so a true a true feedback loop through both filter cores is formed. This allows you to dial in more unique resonance sounds or drive the complete circuit into self oscillation, and can often lead to extreme glitching and rhythmic beating.

Please note that the feedback path is mixed into ***INPUT A*** AFTER the ***LEVEL*** control, so you have individual control over both the ***INPUT A*** level and the ***FEEDBACK*** level going into ***CHANNEL A***. Refer to the block diagram on **page 3** to help understand the signal path.

FEEDBACK KNOB

The ***FEEDBACK*** knob controls the level and polarity of the feedback path.

- At the centre position (12 o'clock), the ***FEEDBACK*** VCA is set to zero.
- Turing the control CLOCKWISE from centre will start to mix a copy of ***OUT B*** back into ***IN A***.
- Turning the control ANTI-CLOCKWISE from centre will start to mix an INVERTED copy of ***OUT B*** back into ***IN A.***



FEEDBACK CV

When a CV signal is patched into the ***FEEDBACK CV*** input, the ***FEEDBACK*** knob becomes an attenuverter for the incoming voltage.

The usable range is –5V to +5V, where 0V = no feedback, –5V = full inverted feedback and +5V = full non-inverted feedback

This allows the feedback level and polarity to be modulated dynamically - for instance, modulating feedback inversion with a slow LFO can create evolving tonal movement, while faster modulation such as envelopes can create punchy attack transients.

CALIBRATION

A freshly built ***DOUBLE BUBBLE*** will track fairly well to V/Oct frequency CV, but if you want to dial it in even further each channel can be calibrated finely allowing you to achieve solid tracking over at least 4 octaves.

This is done by adjusting the blue multi-turn trimmers accessible from the left side of the module.

You will need:

- A precise CV source such as a keyboard with CV output, a MIDI to CV device or dedicated prevision voltage source such as the Befaco Voltio.
- A way of plugging the output into a tuner e.g. a guitar pedal tuner, audio interface + DAW or an oscilloscope.
- A small flat-head screwdriver.

1. Start with ***CHANNEL A*** - set it to ***LP*** mode plug ***OUT A*** into your tuner.
2. Turn the ***RES A*** knob fully clockwise until ***CHANNEL A*** starts to oscillate.
3. Plug your voltage source into the ***V/OCT A*** input, and play the lowest C note you can, or send 0V from your voltage source.
4. Use the large ***FREQUENCY A*** knob to tune the output to as close as you can get to a low C, e.g C1 (32.7 Hz) or C2 (65.41Hz).
5. Now play a note an octave higher, or send +1V from your voltage source.
6. Check your tuner - this note should be 1 octave higher than the first note (double the frequency).
7. If the note is **HIGHER** than what it should be:
   - Turn the CH A V/Oct trimmer **CLOCKWISE** half a turn.

   If the note is **LOWER** than what it should be:
   - Turn the CH A V/Oct trimmer **ANTI-CLOCKWISE** half a turn.
8. Go back and play the original low octave on your keyboard, or set your voltage source back to 0V. Any adjustment of the trimmer will have changed the original tuning, so now go back and repeat steps 4 - 7, making small adjustments at a time until your two octaves are in tune. This will require multiple passes.
9. When you are happy with the tracking of the two octaves, you can move through some higher octaves. Repeat the same process are before using higher octaves, again making very small adjustments at a time, until you have solid tracking over at least 4 octaves.
10. Now that ***CHANNEL A*** is calibrated, repeat the same process, but plug in and out of ***CHANNEL B***.

PATCH EXAMPLE **DUAL MONO FILTER**

This patch shows how ***DOUBLE BUBBLE*** can be used as two completely separate and unrelated filters.

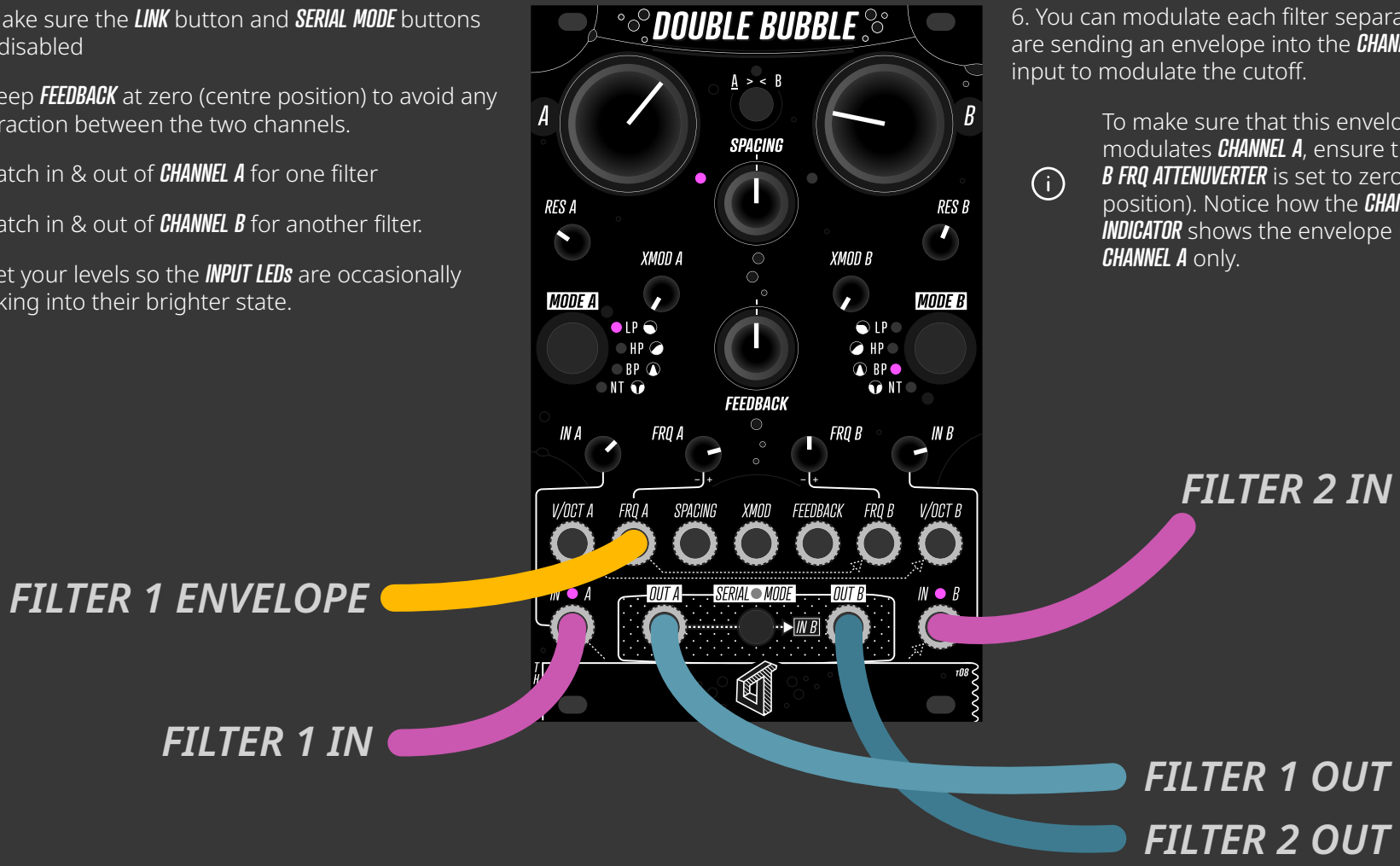
1. Make sure the ***LINK*** button and ***SERIAL MODE*** buttons are disabled

2. Keep ***FEEDBACK*** at zero (centre position) to avoid any interaction between the two channels.

3. Patch in & out of ***CHANNEL A*** for one filter

4. Patch in & out of ***CHANNEL B*** for another filter.

5. Set your levels so the ***INPUT LEDs*** are occasionally peaking into their brighter state.



6. You can modulate each filter separately; here we are sending an envelope into the ***CHANNEL A FRQ CV*** input to modulate the cutoff.

To make sure that this envelope only modulates ***CHANNEL A***, ensure that the ***CHANNEL B FRQ ATTENUVERTER*** is set to zero (centre position). Notice how the ***CHANNEL A FREQUENCY INDICATOR*** shows the envelope modulating ***CHANNEL A*** only.

PATCH EXAMPLE **MONO IN, STEREO OUT FILTER**

This patch shows how ***DOUBLE BUBBLE*** can be used to bring a mono source to life - transforming it into a stereo signal, adding width and separation to the channels.

1. Make sure the ***SERIAL MODE*** button is DISABLED. This will ensure that ***IN A*** is copied over to ***IN B***.

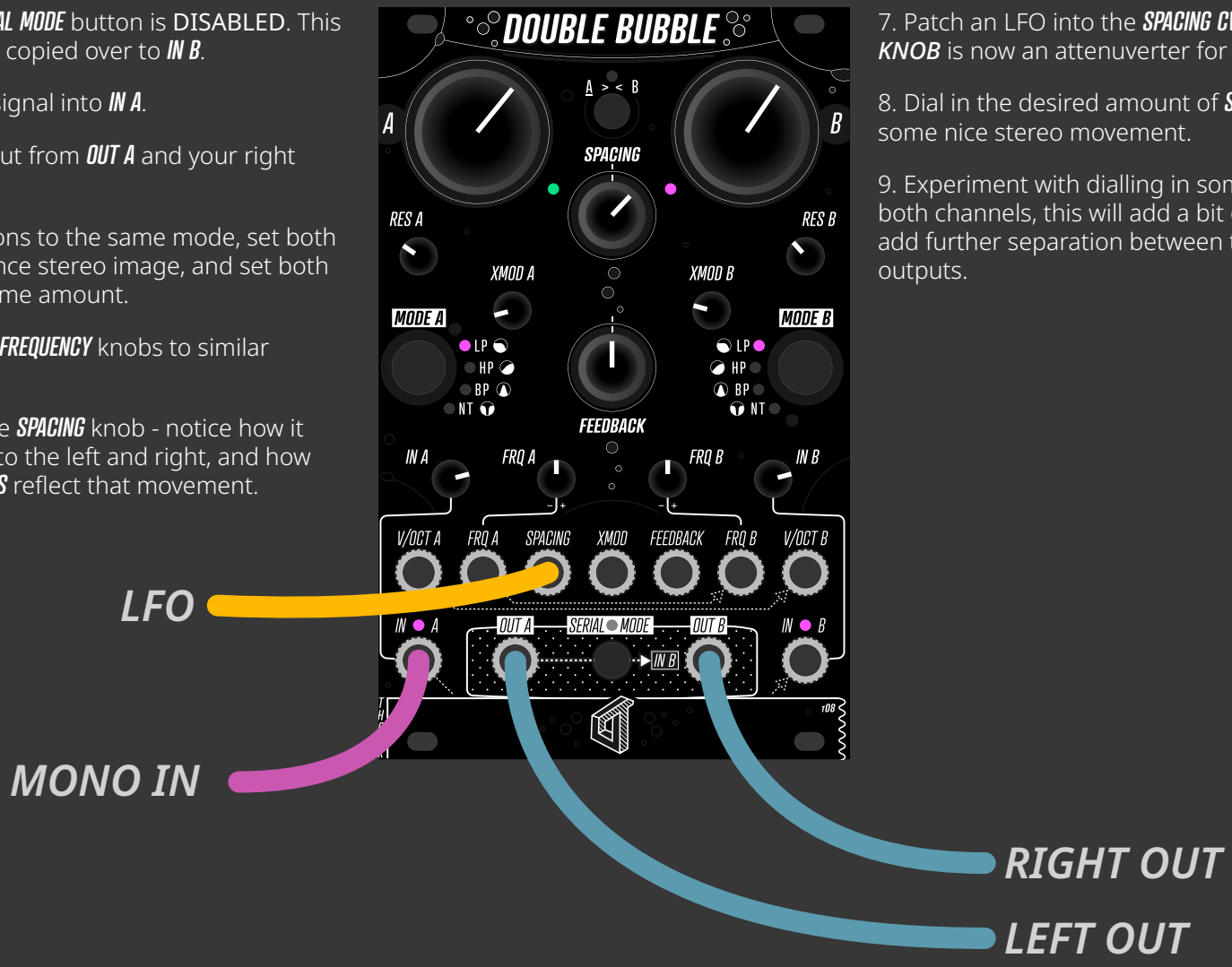
2. Patch your mono signal into ***IN A***.

3. Take your left output from ***OUT A*** and your right output from ***OUT B***.

4. Set both ***MODE*** buttons to the same mode, set both ***LEVEL*** controls to balance stereo image, and set both ***RES*** controls to the same amount.

5. Set both the large ***FREQUENCY*** knobs to similar amounts.

6. Now try turning the ***SPACING*** knob - notice how it will 'steer' the signal to the left and right, and how the ***FREQUENCY INDICATORS*** reflect that movement.



7. Patch an LFO into the ***SPACING CV*** input - the ***SPACING KNOB*** is now an attenuverter for that signal.

8. Dial in the desired amount of ***SPACING CV*** to achieve some nice stereo movement.

9. Experiment with dialling in some ***XMOD*** on one or both channels, this will add a bit of 'fizziness' and add further separation between the left and right outputs.

PATCH EXAMPLE **STEREO IN, STEREO OUT FILTER**

This patch is similar to the last, although it shows how you can use ***DOUBLE BUBBLE*** to filter true stereo signals - great for DJ style effects on full tracks, or processing stereo drum mixes.

1. Enable the ***LINK*** button. The large ***CHANNEL B FREQUENCY*** knob will now be ignored.

2. Patch your left signal into ***IN A***, and right signal into ***IN B***.

3. Take your left output from ***OUT A*** and your right output from ***OUT B***.

4. Use the large ***FREQUENCY A*** knob to control the cutoff of both channels. Try using the ***SPACING*** control for some quick stereo movement.

5. If you want to add some filter movement that is the SAME DIRECTION for both channels (unlike ***SPACING***), patch an envelope into the ***FRQ A CV*** input. Due to the normalisation, this signal will be present at both the ***FRQ A*** and ***FRQ B*** attenuverters. Use both of these to set the modulation amount for each channel.

6. For even more stereo separation, experiment adding in some small amounts of ***XMOD,*** this will add subtle variation to each channel.

PATCH EXAMPLE **VARIABLE WIDTH BAND PASS**

This patch is a good example of using ***SERIAL MODE*** to create a variable width band pass filter by cascading a low-pass filter into a high-pass filter.

1. Enable the ***SERIAL MODE*** button. This ensures that the OUTPUT of ***CHANNEL A*** is then fed into the INPUT of ***CHANNEL B***.

2. Patch your signal into ***IN A*** and use the ***IN A LED*** to help set your level.

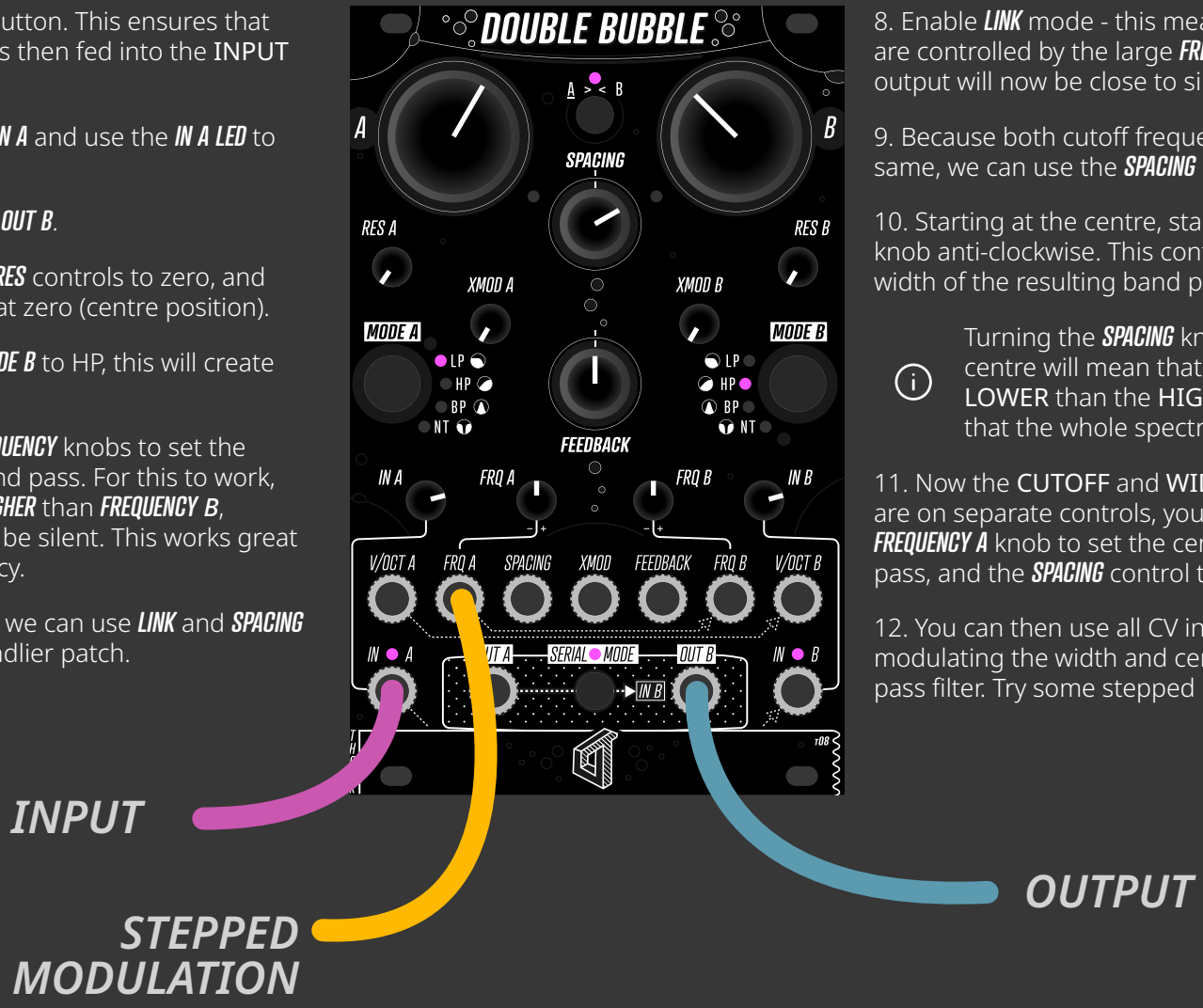
3. Take your output from ***OUT B***.

4. To start with, set both ***RES*** controls to zero, and keep ***SPACING*** and ***FEEDBACK*** at zero (centre position).

5. Set ***MODE A*** to LP, and ***MODE B*** to HP, this will create the band pass effect.

6. Use both the large ***FREQUENCY*** knobs to set the width of the resulting band pass. For this to work, ***FREQUENCY A*** must be set ***HIGHER*** than ***FREQUENCY B***, otherwise the output will be silent. This works great for a fixed cutoff frequency.

7. For even more control, we can use ***LINK*** and ***SPACING*** to make this a much friendlier patch.



8. Enable ***LINK*** mode - this means that both channels are controlled by the large ***FREQUENCY A*** knob. The output will now be close to silent.

9. Because both cutoff frequencies are now set the same, we can use the ***SPACING*** knob to separate them.

10. Starting at the centre, start turning the ***SPACING*** knob anti-clockwise. This control will now set the width of the resulting band pass.

> ⓘ Turning the ***SPACING*** knob clockwise from centre will mean that the LOW PASS cutoff is LOWER than the HIGH PASS cutoff, meaning that the whole spectrum is filtered out.

11. Now the CUTOFF and WIDTH of the bandpass are on separate controls, you can use the large ***FREQUENCY A*** knob to set the centre point of the band pass, and the ***SPACING*** control to set the width.

12. You can then use all CV inputs like normal, modulating the width and centre point of the band pass filter. Try some stepped modulation here!

PATCH EXAMPLE **DOUBLE NOTCH PHASER**

Similar to the last patch, this uses ***SERIAL MODE*** to cascade two filters - this time using notch mode for a phaser effect.

1. Keep ***SERIAL MODE*** engaged, feeding the OUTPUT of ***CHANNEL A*** into the INPUT of ***CHANNEL B***.

2. Patch your signal into ***IN A*** and use the ***IN A LED*** to help set your level.

3. Take your output from ***OUT B***.

4. Keep both ***RES*** controls at zero.

5. Set both ***MODE A*** and ***MODE B*** to ***NT*** (NOTCH).

6. With ***LINK*** mode DISABLED, you can sweep the notches manually to get the phasing effect.

7. With ***LINK*** mode ENABLED, you can use the ***SPACING*** to set the distance of the two notches and use the large ***FREQUENCY A*** knob to move them both together.

8. The fun starts when you start to modulate the two channels. Plug an LFO into ***FRQ A CV*** input, and turn up both ***FRQ A*** and ***FRQ B*** attenuverters to get lots of movement.

9. You could also turn the ***FRQ B*** attenuverter ANTI-CLOCKWISE from centre - this means that the same LFO present at the ***FRQ A*** input will be inverted, making the notches cross over each other.

ⓘ You may have realised already that with ***FRQ B*** attenuverter inverting, this is essentially the same as patching into the ***SPACING CV*** input - sometimes it's useful to be able to keep the ***SPACING*** knob as a manual control and send inverted CV to each channel.

PATCH EXAMPLE **FORMANT FILTERING**

Using two band pass filters, we can achieve vocal like formant filtering.

1. Make sure ***SERIAL MODE*** and ***LINK*** are both disabled.

2. This patch sounds great with a low frequency SAW wave as the input - patch it into ***IN A***.

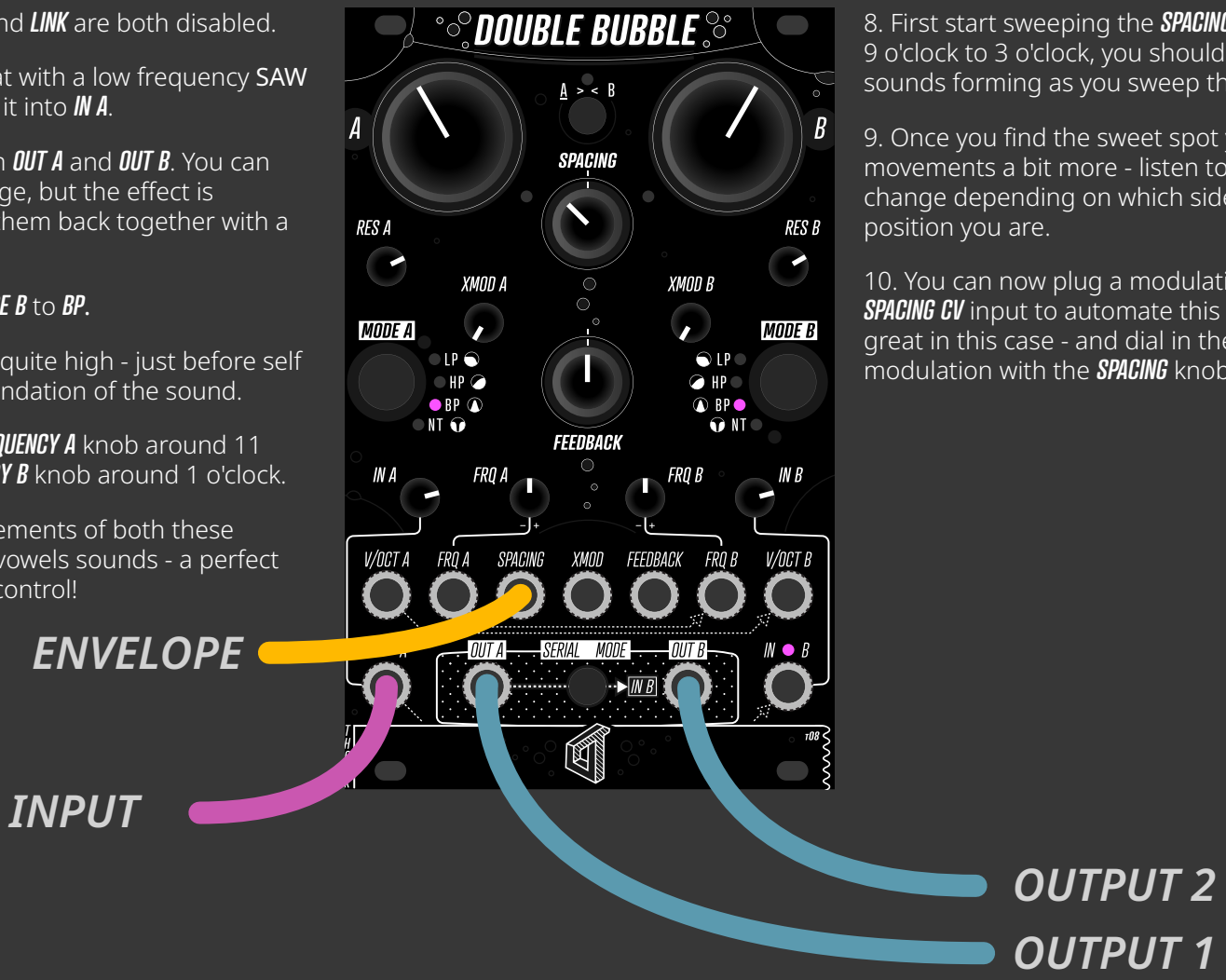
3. Take both outputs from ***OUT A*** and ***OUT B***. You can use them as a stereo image, but the effect is enhanced by combining them back together with a mixer of your choice.

4. Set both ***MODE A*** and ***MODE B*** to ***BP***.

5. Set both the ***RES*** knobs quite high - just before self oscillation - this is the foundation of the sound.

6. Start with the large ***FREQUENCY A*** knob around 11 o'clock, and large ***FREQUENCY B*** knob around 1 o'clock.

7. It is the opposing movements of both these channels that create the vowels sounds - a perfect candidate for the ***SPACING*** control!



8. First start sweeping the ***SPACING*** knob from around 9 o'clock to 3 o'clock, you should hear the formant sounds forming as you sweep the knob.

9. Once you find the sweet spot you can dial in your movements a bit more - listen to how the sounds change depending on which side of the centre position you are.

10. You can now plug a modulation source into the ***SPACING CV*** input to automate this - envelopes work great in this case - and dial in the amount of modulation with the ***SPACING*** knob.

PATCH EXAMPLE **FM OSCILLATOR**

By making both channels self-oscillate and using the ***XMOD*** controls, ***DOUBLE BUBBLE*** can act like a FM capable VCO.

1. Keep ***SERIAL MODE*** and ***LINK*** disabled.

2. No signal input needed for this patch, take your output from ***OUT A.***

3. Set both ***MODE A*** and ***MODE B*** to ***BP.***

4. Turning ***RES A*** and ***RES B*** all the way up will push each filter into self oscillation. You should hear a sine wave at ***OUT A,*** while ***OUT B*** is oscillating in the background.

5. The large ***FREQUENCY A*** knob will now control the pitch of the sine wave - set it to a comfortable pitch.

6. Now start turning up the ***XMOD A*** knob, this will cause the sine wave at ***OUT B*** to start modulating the pitch of ***CHANNEL A***.

7. This setup is now behaving exactly like an FM oscillator, with ***CHANNEL A*** as the carrier, and ***CHANNEL B*** as the modulator. Try using the large ***FREQUENCY B*** knob to change the pitch of the modulator.

V/OCT SEQUENCE

ENVELOPE (FM DEPTH)

OUTPUT

8. Experiment with different modulation depths with the ***XMOD A*** knob.

9. Once you're comfortable with all the controls, you can plug a ***V/OCT*** keyboard or sequencer into the ***V/OCT A*** input. Due to the normalisation, this will cause BOTH channels to track to this V/Oct signal.

> If you don't want the two channels to track together, you can either plug a dummy cable into ***V/OCT B***, or you could flip the channels - where ***CHANNEL B*** is the carrier wave and ***CHANNEL A*** is the modulator. Then patch your V/Oct sequence into ***V/OCT B.***

10. As both channels are tracking to the V/Oct source, you can use the large ***FREQUENCY*** knobs to offset each channel while staying in tune. Try using the large ***FREQUENCY B*** knob to tune the ***CHANNEL B*** output down an octave, a classic FM trick.

11. Now for more dynamic sounds, try patching an envelope into the ***XMOD CV*** jack, and use the ***XMOD A*** knob to dial in the depth of the modulation.

INSTALLATION and SUPPORT

When installing the module, first ensure your power supply is switched off.

Plug the included power cable into the back of the module, making sure that the RED line of the power cable is aligned with the RED text on the back of the module, as shown in the photo.

This module DOES include reverse polarity protection.

Check out the build guide here:
https://www.thonk.co.uk/bubble

For all customer support please contact us at
support@thonk.co.uk

https://www.thonk.co.uk

https://www.instagram.com/thonksynth


THONK.CO.UK
DOUBLE
BUBBLE


DOUBLE BUBBLE
A
A >< B
SPACING
RES A
RES B
XMOD A
XMOD B
MODE A
MODE B
LP
HP
BP
NT
FEEDBACK
IN A
FRQ A
FRQ B
IN B
V/OCT A
FRQ A
SPACING
XMOD
FEEDBACK
FRQ B
V/OCT B
IN A
OUT A
SERIAL MODE
OUT B
IN B
IN B
tO8
THONK