

# BugBrand PT Delay



The PT Delay is designed to be a characterful and hands-on delay processor based around the PT2399 Digital Delay chip. The chip was only ever specified to produce delay times up to around 350mS, but it is widely known now that 'under-clocking' the chip to extend the delay times produces some very interesting digital artefacts. And while it is a digital effect, the response is actually very analogue – both due to the unique filtering after the delay core, but also because all the surrounding circuitry is pure analogue and tweaked very specifically to the tasks in hand. There are no micro-processors here! I have spent several years investigating the PT2399 chip and this is the culmination of all the works. Please refer to the PT Delay Block Diagram which shows the internal structure of the device.

## **Input Section:**

There are two inputs on Mono (unbalanced) ¼" Jack sockets, each with an Input Level control. Input 1 offers High Gain input (eg. For low level signals like Guitar) while Input 2 is set for Low Gain (eg. Synth inputs). The two inputs are mixed together and this becomes the Dry signal which passes both to the Delay Input and to the Output Mixer. Soft-clip diode limiting has been added to the input mix to ensure proper levels compared with self-oscillating feedback. For optimal clean input levels, turn up the input level until you hear clipping begin to occur and then dial back the level a notch. The clipping can very much be used as an interesting effect as well.

## **Delay Input / Punch:**

A Delay Input Level control was incorporated into the design so that you could achieve dub-style effects. To this a Punch In button was added which passes the Input signal when pressed – the Ext Punch Footswitch duplicates this and both Punch functions can be used simultaneously. Note that the Punch feed is in parallel to the Delay Input feed – if the Delay Input is already set to pass audio then adding with the Punch will increase the input level to the delay section.

## **Delay Time:**

A unique function of the PT Delay is that two independent Delay Times can be set and then selected via the Toggle Time button or footswitch (again, both can be used simultaneously). An LED glows to highlight the active Time Control.

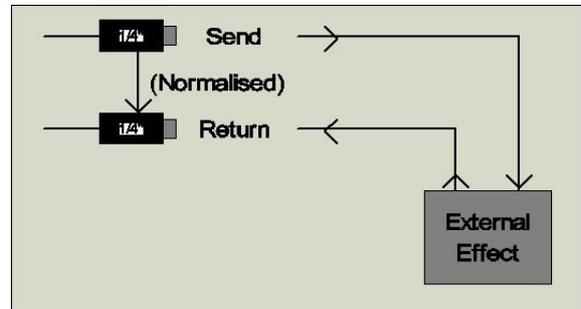
The shortest Delay Time (setting fully counter-clockwise) is around 65mS. The first half-turn focuses on short delays with a time of around 200mS with the control at middle position. Beyond around 500mS (2 o'clock position) the delays begin to get increasingly gnarly due to the nature of the PT Delay chip and by the final ¼ turn you will be hearing some serious digital distortion with delay times up to a maximum of around 2.5 sec.

### Post-delay EQ:

The two Cut/Boost Peaking EQs follow the Delay Core to alter the delay signal and thus the sound through Feedback – this section allows dramatic sound altering potential. Both controls should be set initially to central position and from there they will boost if turned clockwise or cut if turned anti-clockwise. The two peaking frequencies have been chosen purely for what sounds right.

### Feedback:

The Delay Feedback / Regeneration comes post-EQ. The pure Delay Signal first passes out of the Send ¼" Jack and is normalised into the Return ¼" Jack – this forms the input signal to the Feedback control which mixes the signal back to the Delay Input. When a plug is inserted into the Return socket, the normalised connection is broken and the diagram shows how an external effect could be used to process the Feedback path.



Experimentation with different external effects is recommended – different processors will give radically different results. It should be noted that both the EQ settings and any External Effects can have an effect on the optimal Feedback control point. As with the soft-clipping on the Input section, there is limiting installed around the Delay Core so that when Feedback is pushed into self-oscillation the results do not 'run away' into digital clipping but instead take on a nicely saturated tone.

### Alternative Feedback Effect routing:

Due to the required internal routing of the Feedback path it will be heard that when plugging in an external effect (as described above) the first delay will always come out 'clean' (ie. Not effected by the external processor). An alternative method for external feedback processing is achieved by again taking the Send path as before but now the return goes to Input 2 (the level of this input tends to be more suitable than Input 1). In this case you should generally turn down the Delay Mix control to zero – you will then hear the delayed signal only when it has passed out of the Send jack, through the external effect and back in to Input 2. You may also want to turn down the Feedback control and instead use the Input 2 Level control to determine the level of Feedback.

Further Feedback experiments can be achieved simply by taking the Send output (labeled also as Delay Out) and patching this straight back into Input 2.

### Output Mix:

Independent Level controls are provided for the Dry and Delay signals before a final Master Level control. It should be noted that if the Feedback path is being used in normalised mode (ie. no external effect) that the pure Delay signal can be taken from the Send ¼" jack without it affecting the Feedback path.

**Power:**

The PT Delay is supplied with a universal 12V DC supply – this is a switchmode supply that can be used on any worldwide mains supply simply by changing the included plug connector. The PSU has been chosen to minimise the possibility of system noise and feeds an internal linear voltage regulator. Note that early version PT Delays state DC 9V on the input but in fact this should be a minimum of 12V to allow sufficient headroom for the internal regulation. For best operation please only use the supplied PSU.

**Technical Specifications:**

Input/Output – ¼" Mono (Unbalanced) Jack Socket

Power – 12V DC @50mA, centre negative, 2.1mm connector

Note that the DC input is protected against reverse polarity and over current.

Footswitches – both sockets accept momentary short-to-ground footswitches (eg. Keyboard sustain pedal)

**Enjoy!** – Tom Bugs, March 2011

**Questions and comments to [tom@bugbrand.co.uk](mailto:tom@bugbrand.co.uk)**

**Guarantee:**

I take great pride in my work and stand proud behind my machines. I offer a 2 year 'reasonable' guarantee on the PT Delay. If any mechanical or electronic failure occurs within the period, I will repair the fault free of charge. This excludes failure from maltreatment or modification and any cosmetic degradation. Contact should first be made via email to discuss the problem. Shipping to return the device is paid by the user and I cover the return shipping. Failures that are not covered by this warranty may still be fixed at a standard rate.

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