Expanding the Ibanez DL5 Digital Delay

Echo delay is one of the most popular guitar effects and the Ibanez DL5 is a popular low-cost example of this fun effect. It is reliable, easy-to-use, expressive, and graced with a warm tone usually found only on vintage high-priced analog echo-delay pedals. It is also easy to explore and modify internally. This article explores the ways to customize your DL5 and expand its range of sounds.

There are three basic mods to the DL5: increasing the delay length, increasing the repeat level, and switching off the original guitar signal so that only the echo signal is put out from the petal. Increasing the repeat signal is the simplest mod, so it's first.

Increasing the repeat signal
(parts: none <> tools: small Phillips screwdriver)

Open the case (see appendix for instructions). The repeat adjust is a trim potentiometer (pot) marked SR1 (labeled '103') located directly below (towards the bottom of the circuit board) the Repeat knob (near the top center). Turn this pot about 30 to 45 degrees clockwise (from the top) to increase the level of the delay sound that gets fed back into the input. Too much adjustment will cause the echo to start making feedback noise and too little leaves each echo sounding too weak. The level should be set so that at maximum each new echo is almost as loud as the previous echo. Even with the internal repeat feedback level boosted, its final strength can still be set lower with the external Repeat knob. This mod can be done on nearly all delay pedals.

Switching the input (dry) signal
(parts: small slide switch: single pole-single toggle <> tools: fine-tip soldering iron)

This mod allows preventing the original guitar input signal (the dry signal) from mixing with the delay echo signal that is put out from the DL5. This allows the dry signal and the echoes to go to separate amps or to separate effects like distortion. For example, the lead guitar solo in Pink Floyd's *Money* has distorted dry signal on the left channel and a single distorted echo on the right channel.

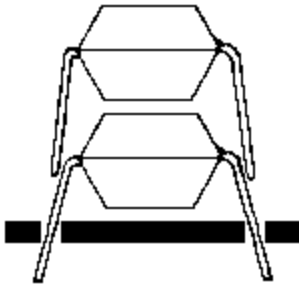
Unsolder the right side of R38 (47K ohms – yellow:purple:orange:gold). The dry signal is sent through R38 to be mixed with the echo signal for output. Wire a simple switch between the resistor lead and the solder pad. The switch itself can be located in the battery compartment area and be connected by two wires to the resistor lead and solder pad. With the switch turned on, the DL5 operates normally. Switched off, only the echo signal is put out by the DL5. The solder pad is located on the right side (looking at the component side of the circuit board) of R38.

Doubling the Delay time

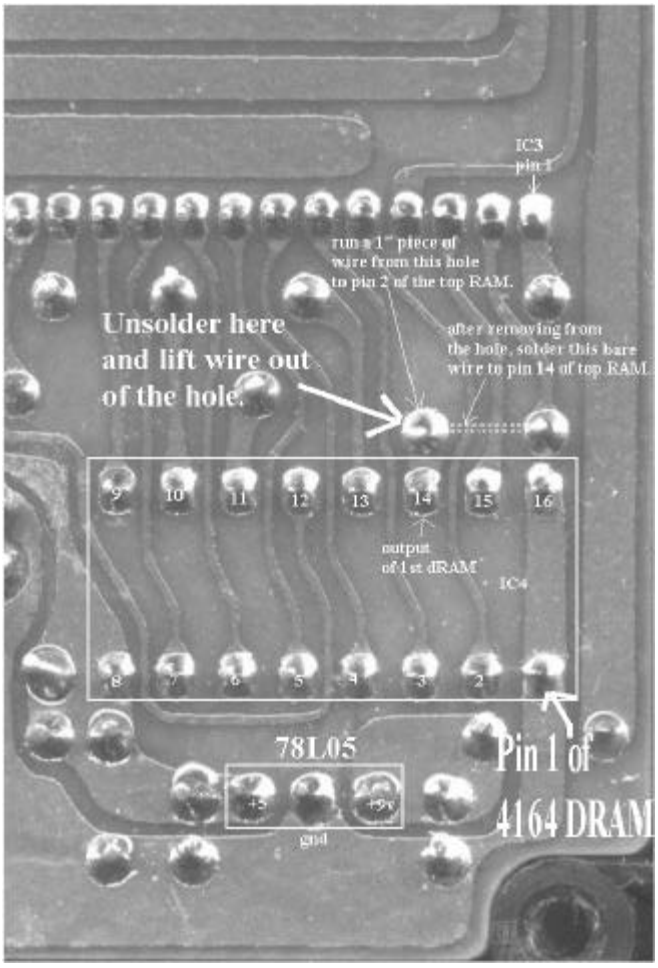
(parts: one 4164-type (64Kx1) D-RAM IC; 1" thin wire <> tools: fine-tip solder iron)

This DRAM chip is available at www.jameco.com part number: 41662CH $0.59

The DL5 uses a single dynamic RAM chip to store the guitar signal for the length of the echo. You can double the echo time by 'piggy-backing' a second identical dynamic RAM chip on top of the original one. Then connect the output pin of the first (bottom) RAM chip to the input of the second (top) and the output of the second RAM to the point where the original RAM's output went.



Solder all the pins of the two chips together except pins 2 (data in) and 14 (data out). Bend pins 2 and 14 on the top chip out away from the pins of the lower chip. Unsolder the jumper wire connected to pin 14 of the lower chip. Bend this wire up and solder it to pin 14 of the upper chip. Solder a wire from the hole that the wire came from to pin 2 of the upper chip. The output of the lower chip is now connected to the input of the upper chip and the output of the upper chip is connected to the echo generator. That's all you need to do to double the delay time.



How the DL5 works

The Ibanez DL5 is a hybrid between an analog and a digital delay. It uses a custom Echo Generator chip designed for a karaoke machine instead of a microprocessor. This echo chip (a Mitsubishi M50195P) uses 1-bit oversampling at 650,000 comparisons/second instead of the ADC/DAC sampling method of standard digital delays. In its factory design, the M50195 chip stores 100 milliseconds worth of 1-bit samples into a 4164 dRAM. The DL5 however allows the user to slow the speed of the echo-chip's clock to get 400 milliseconds of delay time. The trade-off is a lowered frequency range for the input signal. Setting the upper frequency limit to about 5KHz gives the DL5 its 'warm – analog' sound.

Appendix:

Opening the Ibanez Soundtank case All modifications are internal so first we must open the case. There are four screws on the bottom metal plate. Unscrew them and lift off the plate. (Don't lose the screws) Under the plate there is a black plastic insulator sheet to prevent the metal of the circuit board from touching the metal bottom plate. In the center of the bottom side there is a screw with a metal strip that has two holes in its ends. This is a grounding strip that connects the ground (the part of the circuit that has no electricity flowing through it) of the circuit board to the bottom metal plate. Unscrew this piece and set it aside. Remove the insulator sheet, also.

Here we see the solder side of the circuit board. In order to work on the other side of this board, the adjustment knobs have to be popped off. The knobs (for Level, Repeat, and Delay Time) are plastic pressed onto the long plastic shafts of the potentiometers (the variable resistors). To remove them, wrap a thick rubber band around the base of the knob, grip the knob tightly with a vise-grip tool, and pull directly upwards. The rubber band will keep the vise grip from scoring and chewing the plastic on the side of the knob.

The board slides out of the case top now and the components are accessible. There are four wires extending to the case top. The green and orange wires connect to the indicator LED. The black and red wires go to the battery clip.

Intermittent Foot Switch toggling Change C4 next to the switch from .001 to .005uF. This is a common problem on all older Ibanez Soundtank pedals.

Wall-Wart Power Supply Hum Most effects use only around 10 milliamps, but most digital delays use about 60-80 milliamps. The DL5 uses 50mA at fast delays and 30mA at slow delay lengths. With a second dRAM chip it uses about 50mA at max delay time. Inexpensive AC adapters will have much ripple voltage at this milliAmp load level and this ripple voltage will cause hum in the signal output.

Remove the hum by cutting the positive voltage trace near the power connector and adding an LM317L adjustable voltage regulator chip (set for +9 volts) between the power jack plus terminal and the positive circuit board trace. Connect the 317L Vin to the power jack and Vout to the positive trace. Two resistors set the voltage level. The two resistor values to use for the 317L are: 220 ohms between Vout and Vadj, and 1360 (two 680 ohms in series) between Vadj and ground. Also use a +12 volt 'wall-wart' adapter instead of +9 volts.