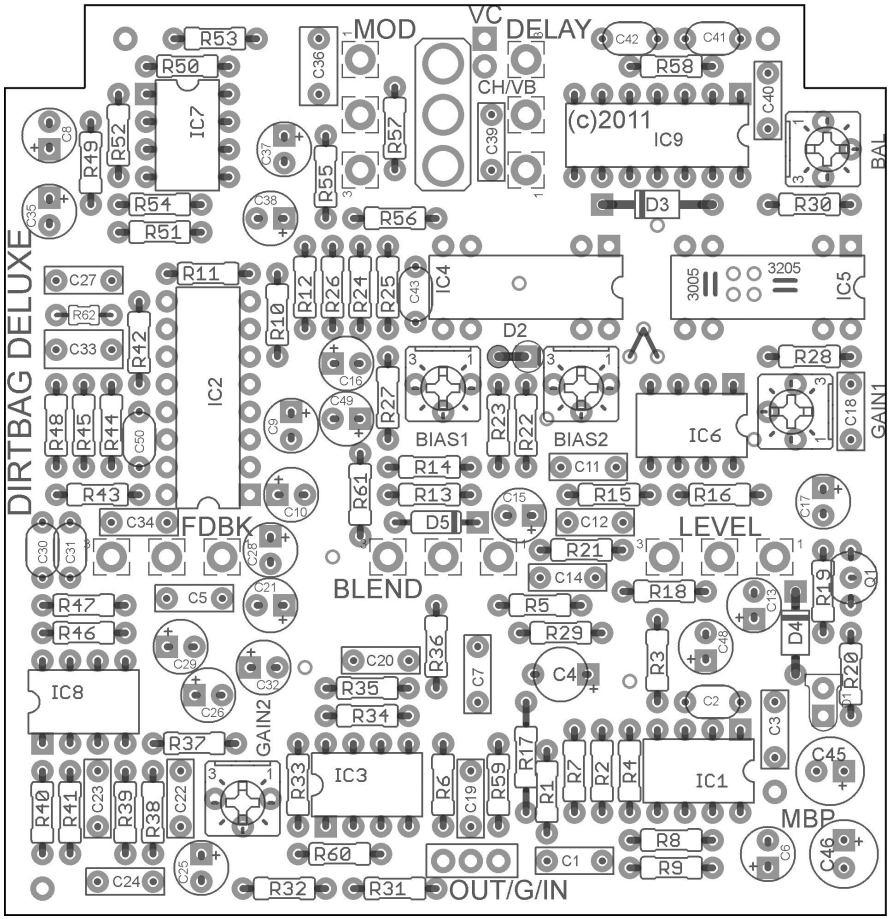
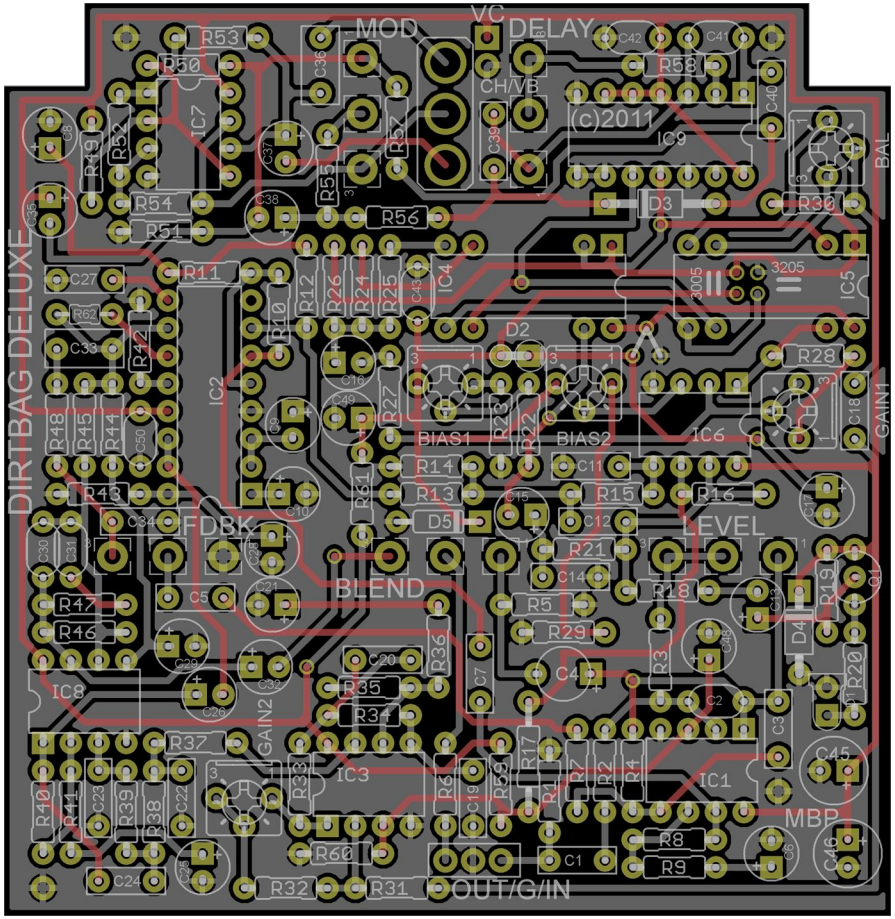
DIRTBAG DELUXE

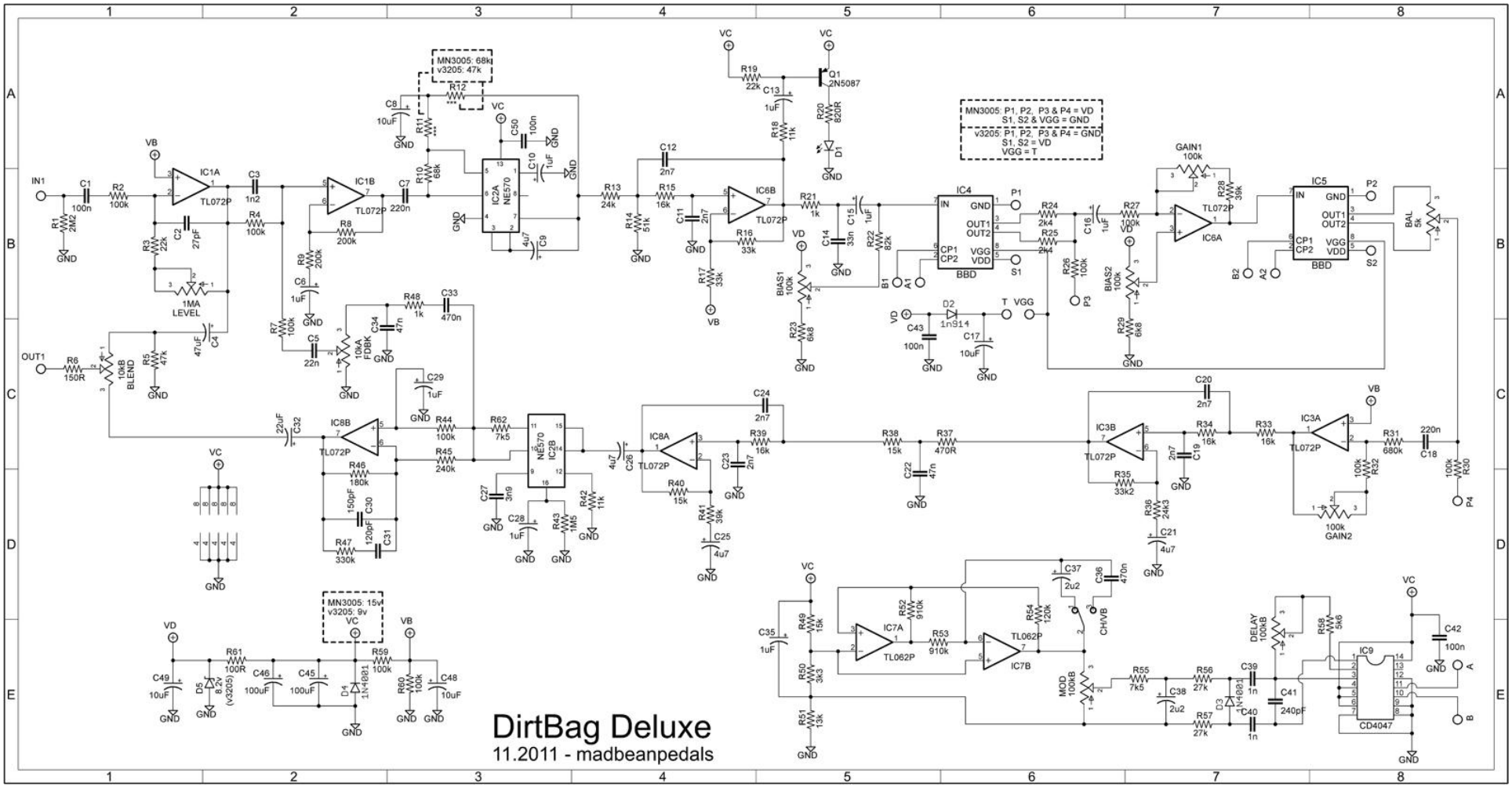
11.2011 madbeanpedals
Revised 12.12.11 – see page 5
PCB Dimensions: 3.2”W x 3.3”H





Resistors		Resistors		Caps		Caps		Diodes	
R1	2M2	R32	100k	C1	100n	C32	22uF	D1	LED
R2	100k	R33	16k	C2	27pF	C33	470n	D2	1n914
R3	22k	R34	16k	C3	1n2	C34	47n	D3, D4	1N4001
R4	100k	R35	33k2	C4	47uF	C35	1uF	D5	8.2v Zener
R5	47k	R36	24k3	C5	22n	C36	470n	**ICs**	
R6	150R	R37	470R	C6	1uF	C37	2u2	IC1	TL072
R7	100k	R38	15k	C7	220n	C38	2u2	IC2	NE570
R8	200k	R39	16k	C8	10uF	C39	1n	IC3	TL072
R9	200k	R40	15k	C9	4u7	C40	1n	IC4	***
R10	68k	R41	39k	C10	1uF	C41	240pF	IC5	***
R11	*	R42	11k	C11	2n7	C42	100n	IC6	TL072
R12	*	R43	1M5	C12	2n7	C43	100n	IC7	TL062P
R13	24k	R44	100k	C13	1uF	C45	100uF	IC8	TL072
R14	51k	R45	240k	C14	33n **	C46	100uF	IC9	CD4047BCN
R15	16k	R46	180k	C15	1uF	C48	10uF	**Transistors**	
R16	33k	R47	330k	C16	1uF	C49	10uF	Q1	2N5087
R17	33k	R48	1k	C17	10uF	C50	100n	**Switch**	
R18	11k	R49	15k	C18	220n			CH/VB	SPDT
R19	22k	R50	3k3	C19	2n7			**Trimmers**	
R20	820R	R51	13k	C20	2n7			BAL	5k
R21	1k **	R52	910k	C21	4u7			BIAS1	100k
R22	82k	R53	910k	C22	47n			BIAS2	100k
R23	6k8	R54	120k	C23	2n7			GAIN1	100k
R24	2k4	R55	7k5	C24	2n7			GAIN2	100k
R25	2k4	R56	27k	C25	4u7			**Pots**	
R26	100k	R57	27k	C26	4u7			BLEND	10kB
R27	100k	R58	5k6	C27	3n9			DELAY	100kB
R28	39k	R59	100k	C28	1uF			FDBK	10kA
R29	6k8	R60	100k	C29	1uF			LEVEL	1MA
R30	100k	R61	100R	C30	150pF			MOD	100kB
R31	680k	R62	7k5	C31	120pF				

*** IC4, IC5: MN3005 or v3205
* R11, R12: 68k if using MN3005, 47k if using v3205


DirtBag Deluxe
11.2011 - madbeanpedals
MN3005: 68k
v3205: 47k
MN3005: 15v
v3205: 9v
MN3005: P1, P2, P3 & P4 = VD
S1, S2 & VGG = GND
v3205: P1, P2, P3 & P4 = GND
S1, S2 = VD
VGG = T
IC1A
IC1B
IC2A
IC2B
IC4
IC5
IC6A
IC6B
IC7A
IC7B
IC8A
IC8B
IC3A
IC3B
TL072P
TL062P
NE570
BBD
CD4047
1MA LEVEL
10kB BLEND
10kA DBK
BIAS1 100k
BIAS2 100k
GAIN1 100k
GAIN2 100k
MOD 100kB
DELAY 100kB
BAL 5k
CHVB
IN1
OUT1
VB
VC
VD
GND

What Is It?

The **DirtBag Deluxe** (based on the EHX Deluxe Memory Man™) allows you to build what is probably the most loved bucket brigade delay of all time. It offers around 550ms of pure analog delay with the addition of chorus or vibrato modulation. The **Dirtbag** also incorporates modern accoutrements via true bypass operation, center-pin negative 9 – 15vDC operation and the ability to use different version of currently available BBD chips.

WARNING: This is an incredibly difficult project. This is not a "first time" build by any means. Do not take on the **DirtBag** unless you feel confident in your abilities, or you may end up wasting quite a bit of time and money! That said, if you take your time and follow the instructions carefully, you should be able to get the **DirtBag** working with relative ease.

Development of this project took place over several months, and should be relatively bug-free despite its complexity. Special thanks to forum member Scruffie and FSB member Dirk Hendrik who provided information and feedback during this process.

Controls

Level - This adjusts the amount of gain at the input stage of the circuit.
Blend – This controls the amount of delay signal mixed in with the signal from the input stage.
Delay – The overall delay produced by the two series BBD devices. Counter-clockwise is slapback and full clockwise should yield about 500 – 550ms of delay.
Fdbk – This is the amount of delay signal fed back to the input of the delay chain. It controls the number of delayed repeats,
Mod – This sets the overall modulation of the delay signal. Counter-clockwise is no modulation.
C**H/VB** – Stands for Chorus/Vibrato. This SPDT switch sets the type of modulation used by the **Mod** control. Chorus produces a very pleasing, spatial spread to the delay signal. Vibrato yields shorter pitch shifting around delayed notes. At low **Mod** settings, the modulation is both subtle and musical. At high **Mod** settings, the modulation becomes very intense and will produce some wild "sea-sick" type effects.

Notes

The **DirtBag Deluxe** can be built with three different types of BBD devices. The first is the MN3005, which were used in the vintage Deluxe Memory Man. Second is the MN3205, which have lower current consumption and different power requirements than the MN3005. Finally, the **DirtBag** can be built with the Coolaudio pin-for-pin clone of the MN3205: the v3205. These are readily available and used in a number of modern analog delay pedals.

The bad news is that the MN3005 and MN3205 are scarce; much more now than just a couple of years ago. It's a good bet that if you do not already have some of these in your possession, then you will have a very difficult time locating genuine chips. There are many counterfeit and re-labeled chips being sold on eBay and elsewhere that purport to be MN3005 (or 3205). For this reason, I recommend not buying these from unknown or overseas vendors on eBay unless you have good reason to believe they are genuine. You may be able to get some through members of the DIY community or an international broker like UTSource. However, even UTSource has sent out some fakes (most likely unknowingly) in the past.

The good news is that even in the absence of the MN3005 and MN3205 you can still build a totally righteous analog delay with the v3205. These are easy to get, and can be purchased from smallbear or similar vendors for about $4.50 each.

What's the difference? Do the different chips sound different?

Yes. They sound different; but, only a very little bit. The biggest difference isn't really in the actual technology behind the chips, but more likely in the voltage that runs them. The MN3005 can be run off 15v and the MN3205 and v3205 must be powered under 9v to operate properly. The added headroom allowed by running both the BBD and rest of the delay circuit at 15v (like the Deluxe Memory Man) can account for slight differences in tonality and warmth produced by the effect. However, this difference is subtle and whatever added headroom one gains is always mitigated by the fact that analog delay, at its core, is a sound degradation device. The purpose of analog delay is to destroy the purity of the input signal in incremental bits over time. That is where the "warmth" of the effect is created.

Having built many analog delays with different BBD devices I can honestly say I like them all, and would happily use any version I had available. The real magic in analog delay is how you interact with it. Finding the right delay time, repeats, blend and modulation and playing off those dynamically is where it's at: it's not in the bits and pieces in the box.

IOW: don't sweat it! Build the version with the parts you can get and forget about it. If you like the way the Memory Man sounds then you will love the **DirtBag Deluxe**.

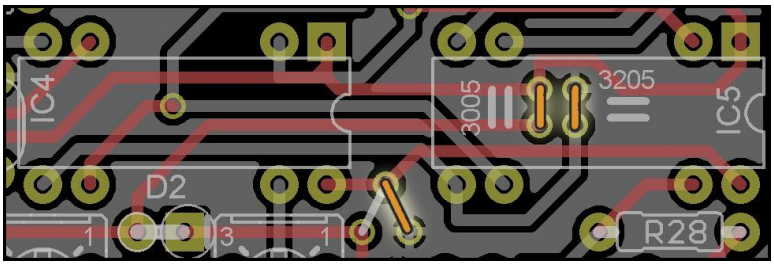
If you plan on building the MN3005, you will need to utilize a Road Rage board, or similar charge pump design, to supply the board with 15vDC (regulated) instead of 9v. Please refer to the Road Rage documentation on the Projects page of the madbeanpedals website for more info. You should use an LT1054 charge pump and an LM7815ACT or similar regulator (the T0-220 type which provides up to 1A of current).

REVISION (CRITICAL): Some builders of the v3205 version of this project have run into distorted repeats. There is a simple solution to this issue. Replace R21 (1k) with 100k and C14 (33n) with another 100k resistor. This forms a voltage divider which eliminates overloading the lower headroom of the v3205. The original 1k/33n forms a low pass filter with a corner frequency of about 4825 kHz. Even though this fix eliminates this filter, it seems that the low overhead of the v3205 does not impact the delay tone in a significant way. Further tests also found that R10 could be omitted from the compressor portion of the NE570, but this is not critical. As a reminder, you will want to use 47k for both R11&R12 when building the v3205 version.

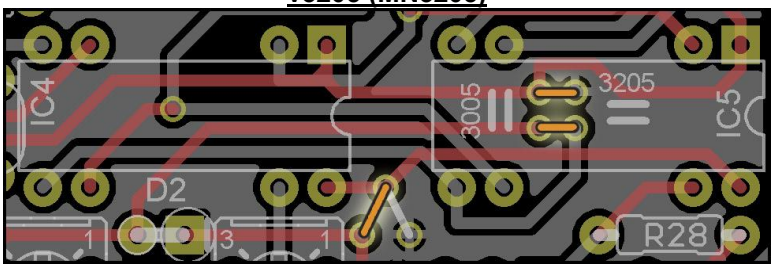
Let's Build It

There are three jumpers to set on the board under IC5 depending on which BBD you are using. Note that you don't want to mix and match BBDs. You need to use two MN3005, two MN3205 or two v3205 devices.

MN3005



v3205 (MN3205)



These jumpers connect the VDD, ground and VGG pins of both BBDs to their proper sources simultaneously. The MN3005 takes the VD voltage on pins 1, ground on pin5 and VGG is connected to ground on pin8. For the v3205, pin1 connects to ground, pin5 connects to approximately 8.2v (VD) set by D5 and VGG is about 14/15 of the VD voltage through the voltage drop over D2.

Note that if building the MN3005, you should omit D5 from the board. The 8.2v Zener is only used for the v3205/MN3205. You should also omit D2 and C17.

After setting the jumpers, I recommend populating the board with all the resistors IN ORDER. This will lessen the chance of placing the wrong value resistor in a place that could later cause problems. Solder the resistors in place on the bottom of the board.

Note that for the MN3005, R11 & R12 need to be 68k. For the v3205/MN3205 they should be 47k.

If you want to go the extra mile you can top-solder the resistors, too. This is not necessary for the effect to function properly provided you have used good technique on the bottom side, but it does lend itself to a more professional look.

Just be careful not to apply too much solder or heat to the pads as this will result in large solder bulbs or potential component damage.

After the resistors, place all the IC sockets and trimpots on the board and solder in place.

Take a little break…no kidding.

Finally, place the remaining components, the film and electrolytic caps, diodes and transistors and solder them in place. Expect to spend 2-3 hours on this process….there are a lot of parts

An important note on some components:

Extra care should be taken with C41, the 240pF cap used to set the clock signal on IC9. You want to use as close to 240pF as possible. Note that many ceramic caps measure well under their stated values. If you have a multi-meter that reads capacitance, measure a few out and pick the best one. You can also add different value in parallel to get close to the 240pF value (remember parallel caps result in the sum of their individual values). If you don't have a capacitance meter, consider using a Silver Mica cap here instead of ceramic. You can always socket C41 and use what you have on hand. After biasing the BBDs (details below) you can go back and drop different 240pF caps in to see if they increase the delay time at all.

Similarly, before soldering the PCB mounted pots measure the resistance between lugs 3&1 of several 100kB pots and pick the one closest to the actual 100k value. Use this one for your **Delay** pot. Again, this will give you the widest range of delay time.

Now that you have that sorted out, load your pots and switch on the PCB and solder them up. Note that this PCB allows for 16mm short-pin PCB mounted pots underneath the board, and a solder lug SPDT switch (also mounted under the board).

One last thing before moving onto biasing: **D1** is the "overload" LED. This LED will give you visual feedback on the amount of signal coming off the first couple of gain stages of the effect. The higher the **Level** pot is set, the brighter the LED blinks. This can be soldered in pace (just above **C45**) or you can run wires from the board to the LED for different placement locations. **If you do not wish to use the "overload" LED (it's mainly a visual effect) you can omit R18, C13, R19, Q1 and R20 from the PCB along with the LED.**

Biasing

Biasing the **Dirtbag** for operation is actually pretty easy and can be done without a scope. You will need to use an audio probe. Before connecting the board up, set the **BIAS1, BIAS2** and **BAL** trimmers to their middle positions. Set the **GAIN1** and **GAIN**2 trimmers fully counter-clockwise. Finally, set the **Level** somewhere in the first have of its rotation, **Blend** about ¼ up, **Delay** about halfway up, **Mod** fully counter-clockwise and **Fdbk** to about the middle.

Now connect the input from your guitar (or signal generator), the output to your amp and power up the board with your power supply (make sure you have a common ground connection). Test to see if you are getting signal through the effect. You may or may not hear any delay at this point. You should be able to hear volume changes when increasing or decreasing the **Level** control. If you do not get any signal through, re-check your connections and make sure there are no errors in your build.

Once you have verified the pass-through signal, disconnect the output to your amp and connect your audio probe to the amp. Now you will be able to probe the audio signal on the board wherever you place the probe tip.

Probe pin3 of IC4 while sending some signal through. Adjust **BIAS1** until you get the cleanest delayed signal possible.

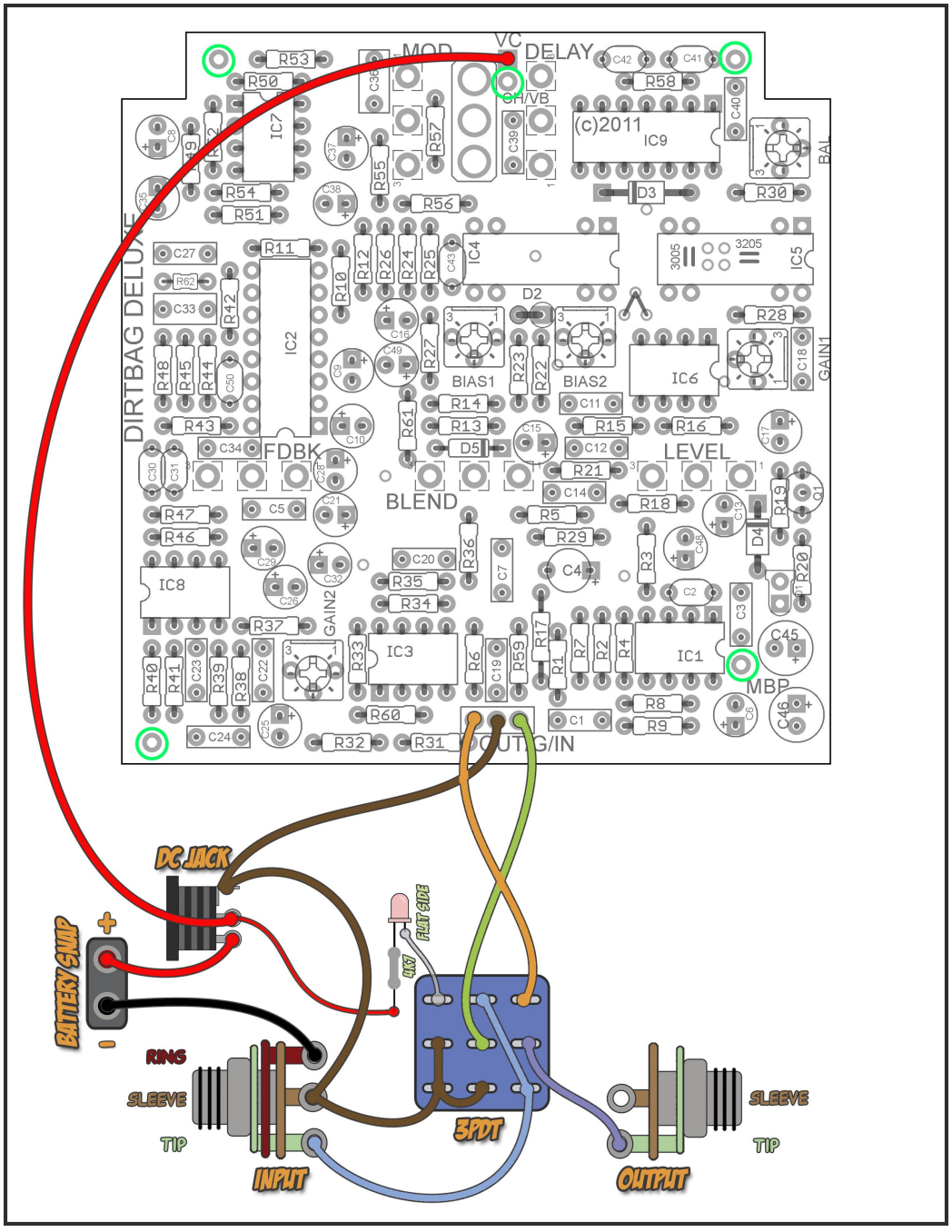
Repeat the same process with pin3 of IC5. Adjust **BIAS2** until you get the cleanest delayed signal possible. You should be able to leave the **BAL** trimmer in its middle position.

Now re-connect the output from the PCB to your amp. You are done with the audio probe.

Now we will set the gain trimmers. Turn your **Fdbk** pot all the way up. It may or may not self-oscillate at this point. If it does oscillate, you do not need to make any adjustments. If it does not, turn both **GAIN1** and **GAIN2** incrementally clockwise. You want to make small changes simultaneously to the trimmers until the repeats start to self-oscillate. Once you reach this point, you are finished.

Note this is the “layman’s way” of biasing the **DirtBag** and it works quite well. If you wish to use a scope to professionally configure its operation please take the time to Google the factory set up guide for the Deluxe Memory Man. You should be able to find information on both the EHX website and some on FSB.

Wiring

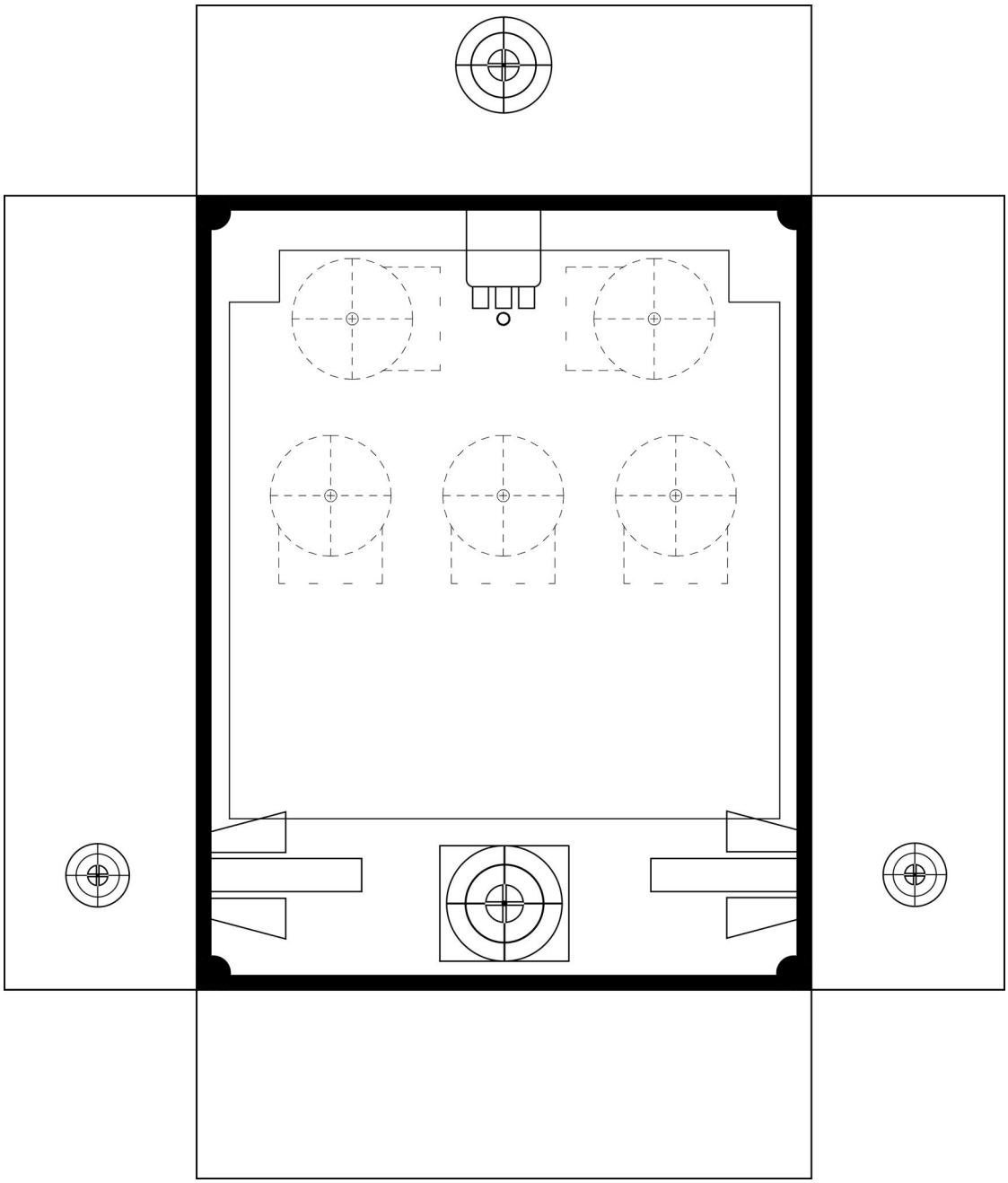


This is the wiring for the MN3205/v3205 version. If you are building the MN3005 version, you need to use a **Road Rage** (or similar charge pump design) for 15v operation. Please refer to the Road Rage documentation for information on building the charge pump.

The green circles indicate ground pads. You do not have to use all of them. They are there for convenience.

Drill Template 1590B

5.8”W x 6.8”H @ borders



This template is approximate. Please check carefully before committing to drilling your enclosure

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