Hey Laurie, do you agree with the info in this post?

by **Clean Channel** » 15 Feb 2014, 04:16

I've seen people copy and paste the following post several times over the past while. It was originally posted on the TDPRI forum from a contributor named 11guage.

I remember the first time I read it thinking some of the facts didn't line up with what I had learned elsewhere. In particular I recall thinking I had read something from Laurie that contrasts this, but I can't remember what. Every time I see it a reference to this post I think I should try and verify it through you fine folk, so here we go.

I'd be interested to hear some feedback from all stompboxzone members, and particularly from Laurie who IMO likely knows more about Boss pedals than BOSS does.

Here's the post:

The OD-1 to SD-1 evolution wasn't really linear.

The OD-1 made its debut in November of '77. It went through a lot of revisions with different op amps and such. But by February of '81 the SD-1 was released as an improvement to the "final evolution" of the OD-1. Boss felt that a tone circuit was needed, so one was added.

...By extension of that, the SD-1 is primarily a final rev. OD-1 with the tone circuit. Boss had gone to the same 4558 chip as the TS with the final OD-1D's and all of the OD-1E's. Well, TS freaks will argue that it's different because Boss used the TL4558P, uP4558C, and C4558C along with the "real" JRC4558D.

IMO, most differences that people hear between the OD-1 and SD-1 are with the OD-1A to OD-1B series, which had the most circuit differences, and used the RC3404ADB and uPC4741C op amps. Boss had NO issues sourcing their parts from the lowest bid source, which meant NEC, TI, or whomever was cheaper than JRC! This is witnessed with the DS-1 to this day, as well as the numerous Boss pedals that use the "dreaded" L series op amps (8 pins in line).

The SD-1 has remained just about the same as it was in '81. The op amp now has two D's, but that just means dual layer, or quieter operation, slightly more gain as a result (negligible IMO, really). Even when Boss opened their factory in Taiwan, the SD-1 stayed the same.

The OD-3 has nothing in common with the OD-1. It is the offspring of the OD-2. The OD-2 was a radical departure in stompbox design, at least for Boss. It has NO op amps at all. It uses a configuration of transistors to simulate a crude op amp - the result is more favorable for use in stompboxes since it can't stay linear like a true op amp can - you get more inherent asymmetrical clipping! The downside is that it requires funky biasing and the circuit is complex in comparison to an 8 pin chip. In the case of the OD-2, the "turbo" mode cut the voltage down to UNDER 6VDC, which is why it distorts so readily. The array of transistors requires a pair of jFET's with a PNP bipolar transistor on the output.

...The normal mode with the OD-2 is basically a single gain stage with those three transistors, and the same clipping diode arrangement as the SD-1 in the negative feedback loop of the array. It runs at around 8VDC IIRC. The turbo mode uses a PAIR of those gain stages at lower supply voltage with NO clipping diodes. Both "meet" at the same tone circuit, which is identical to the BD-2.

The BD-2 is the ancestor to the OD-2. It basically takes the turbo mode and does the following things:

- voltage goes up to 8VDC
- first gain stage is set up like a SD-1, cutting all the bass out
- "fixed tone stack" that simulates BF/SF amp comes after first gain stage
- 4 clipping diodes to ground follow the fixed tone circuit
- second gain stage is like first, but doesn't cut bass like the SD-1
- a dual ganged 250K pot controls BOTH gain stages (one was fixed in the OD-2's turbo mode)
- there is a mild filter to remove some bass AND treble after the 2nd gain stage
- same tone stack as OD-2 is next in circuit
- an op amp boost stage comes AFTER the level control, and has a fixed ACTIVE bass boost

The OD-3 is the final offspring (thus far) and differs from the BD-2 in the following ways:

- true 9VDC operation
- first gain stage is unity gain with a fixed "notch" filter (cut before boost)

- second gain stage is like the ones in OD-2/BD-2, but it has clipping diodes before and after it
- third gain stage is a "discrete class A" stage with clipping diodes
- fourth and fifth stages are op amp ACTIVE EQ shaping - they are like a hardwired Baxandall tone circuit (bass and treble)
- tone circuit like in OD-2/BD-2 comes next, but has modified component values (for better bass/treble balance)
- level control is last, with no post boost op amp like BD-2

...The OD-3 gives asymmetric clipping with the most headroom, and the best staging of EQ filtering. There is no funky tone circuitry, all gain stages that clip have diodes to clamp them nicely, and the op amp portion is "encapsulated" within the circuit.

Clean Channel

Re: Hey Laurie, do you agree with the info in this post?

by **sclitheroe** » 15 Feb 2014, 04:31

There's a whole series of really interesting posts by 11 Gauge over on TDPRI, especially about the BD-2. He has an intriguing love/hate relationship with the BD-2.

sclitheroe

Re: Hey Laurie, do you agree with the info in this post?

by **deancrean** » 15 Feb 2014, 19:20

I don't know myself if everything he is saying in that post is right, but I do know that dude is one of the most knowledgeable pedal people on the net.

deancrean

Re: Hey Laurie, do you agree with the info in this post?

by **fuzzbuzzfuzz** » 17 Feb 2014, 15:02

All this makes me think is

a) damn I let that boxed Od-1 go - idiot!
b) OD-2`s are 10 a penny here - why not get one?
c) OD-3 seems a great goto OD pedal - why not!?

fuzzbuzzfuzz

Re: Hey Laurie, do you agree with the info in this post?

by **Laurie** » 21 Feb 2014, 02:15

Clean Channel wrote:
The OD-1 to SD-1 evolution wasn't really linear.

The OD-1 made its debut in November of '77. It went through a lot of revisions with different op amps and such. ***Not really. There were several different manufacturer quad opamps in the same board, then the board switched to dual opamps. So the board has really only had two major versions.*** *But by February of '81 the SD-1 was released as an improvement to the "final evolution" of the OD-1. Boss felt that a tone circuit was needed, so one was added.*

...By extension of that, the SD-1 is primarily a final rev. OD-1 with the tone circuit. ***Yes.*** *Boss had gone to the same 4558 chip as the TS with the final OD-1D's and all of the OD-1E's. Well, TS freaks will argue that it's different because Boss used the TL4558P, uP4558C, and C4558C along with the "real" JRC4558D.* ***No - all the chips Boss used were "real" in that they were factory standard for that run.***

IMO, most differences that people hear between the OD-1 and SD-1 are with the OD-1A to OD-1B series, which had the most circuit differences, and used the RC3404ADB and uPC4741C op amps. Boss had NO issues sourcing their parts from the lowest bid source, which meant NEC, TI, or whomever was cheaper than JRC! ***I'm quite sure the Boss engineers did not sit there saying "JRC has the best tone, but we want it cheaper". THe JRC chips have emerged as having good tone after many years. This feels like snobbery.****This is witnessed with the DS-1 to this day, as well as the numerous Boss pedals that use the "dreaded" L series op amps (8 pins in line).* ***Why are they dreaded? Do all DS-1 pedals sound dreadful? Emotion trumps logic if you let it...***

The SD-1 has remained just about the same as it was in '81. The op amp now has two D's, but that just means dual layer, or quieter operation, slightly more gain as a result (negligible IMO, really). ***Errrr.... NO. DD means it has been selected for lower noise and (IIRC) tighter adherence to the nominal specs. The chip is the same, off the same production line but tested and selected.*** *Even when Boss opened their factory in Taiwan, the SD-1 stayed the same.*

The OD-3 has nothing in common with the OD-1. It is the offspring of the OD-2. The OD-2 was a radical departure in stompbox design, at least for Boss. It has NO op amps at all. It uses a configuration of transistors to simulate a crude op amp - the result is more favorable for use in stompboxes since it can't stay linear like a true op amp can ***Yes it can - they just didn't bias it that way*** *- you get more inherent asymmetrical clipping! The downside is that it requires funky biasing and the circuit is complex in comparison to an 8 pin chip. In the case of the OD-2, the "turbo" mode cut the voltage down to UNDER 6VDC, which is why it distorts so readily.* ***The character and onset of the distortion changes with lower supply voltage.****The array of transistors requires a pair of jFET's with a PNP bipolar transistor on the output.* ***It is not "an array" it is an opamp implemented with discrete components. NOTE: the term "opamp" does not refer to 8 or 14 pin chips, it refers to a circuit configuration. Back in the good old days opamps were implemented with tubes.***

...The normal mode with the OD-2 is basically a single gain stage with those three transistors, and the same clipping diode arrangement as the SD-1 in the negative feedback loop of the array. It runs at around 8VDC IIRC. The turbo mode uses a PAIR of those gain stages at lower supply voltage with NO clipping diodes. Both "meet" at the same tone circuit, which is identical to the BD-2. ***The tone controls are "similar", not identical.***

The BD-2 is the ancestor to the OD-2. It basically takes the turbo mode and does the following things: ***Does the BD-2 predate the OD-2? I can't remember. Not sure I'd use the term "ancestor" irrespective of dates. More like useing the same topology because it worked.***

- voltage goes up to 8VDC
- first gain stage is set up like a SD-1, cutting all the bass out
- "fixed tone stack" that simulates BF/SF amp comes after first gain stage
- 4 clipping diodes to ground follow the fixed tone circuit
- second gain stage is like first, but doesn't cut bass like the SD-1
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The OD-3 is the final offspring (thus far) and differs from the BD-2 in the following ways:

- true 9VDC operation

- first gain stage is unity gain with a fixed "notch" filter (cut before boost)
- second gain stage is like the ones in OD-2/BD-2, but it has clipping diodes before and after it ***No they aren't. The diodes are part of the internal feedback path in the discrete opamp composed of Q11, Q13 and Q14.***
- third gain stage is a "discrete class A" stage with clipping diodes
- fourth and fifth stages are op amp ACTIVE EQ shaping - they are like a hardwired Baxandall tone circuit (bass and treble) ***This is not a Baxandall implementation.***
- tone circuit like in OD-2/BD-2 comes next, but has modified component values (for better bass/treble balance)
- level control is last, with no post boost op amp like BD-2 ***The post tone control opamp in the BD-2 is primarily for tone shaping.***

...The OD-3 gives asymmetric clipping with the most headroom, and the best staging of EQ filtering. There is no funky tone circuitry, all gain stages that clip have diodes to clamp them nicely ***What does this mean?****, and the op amp portion is "encapsulated" within the circuit.*

Laurie

Re: Hey Laurie, do you agree with the info in this post?

by **Clean Channel** » 21 Feb 2014, 02:27

Laurie: once again, the accuracy and depth to your post exceeds all expectations. Thank you!!

As I often do with your posts, I'll save it in my files for future reference.

Clean Channel

Re: Hey Laurie, do you agree with the info in this post?

by **Ricey** » 21 Mar 2014, 16:29

Given the similarity in the circuits, if I already have a BD-2 with the Keeley "Fat" switch, would an OD-3 be redundant? Also, can the BD-2 high end be tamed? I an running the tone control fully counterclockwise to match my tone between effected vs. bypassed signal.

Ricey