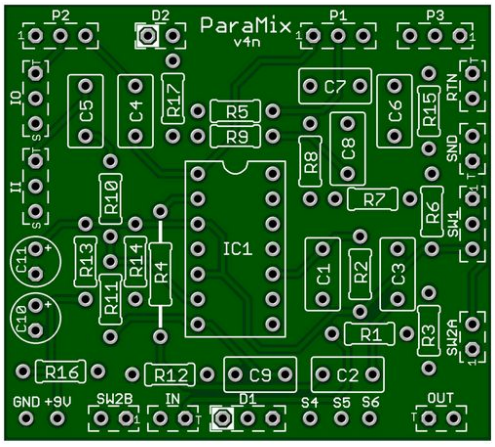
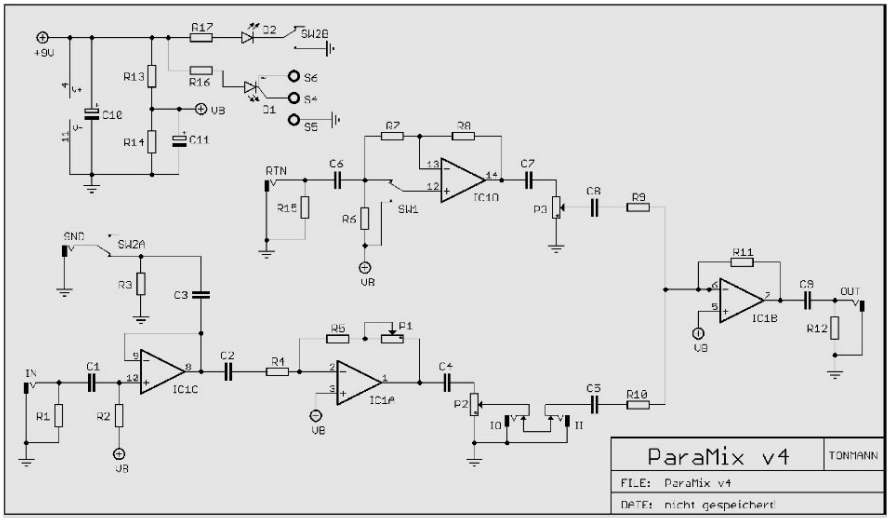
ParaMix v4 by GuitarPCB

A Swiss Army Knife style tool incorporating many benefits including the ability for “True Mixing” and not just simple Blending. The phase switch ensures that both signals at the mix are in phase with each other. Some circuits invert the phase and others do not. No matter what you decide to connect to the Paramix this is never an issue. If the effect is a delay or echo, you can use the “Kill Switch” feature to cut off the signal to the delay or echo and still preserve the “tails”or “repeats”at the mix stage. It allows you to decide exactly how much wet and dry signal you want. Not just blending in a Dry or Wet Signal Ratio. This is a great way to Mix full-blown distortion with the gritty attack of your dry sound for added clarity.



Board Dimensions (W x H) 2.1” x 1.75” ca.53.4mm x 44.5mm



R1	1M	R12	100k	C1	220n	P1	100k Lin
R2	1M	R13	10k	C2	220n	P2	100k Log
R3	1M	R14	10k	C3	220n	P3	100k Log
R4	10k	R15	1M	C4	220n		
R5	12k	R16	3k3	C5	220n	D1	CA Bi-colour LED
R6	1M	R17	3k3	C6	220n	D2	LED
R7	100k			C7	220n		
R8	100k			C8	220n	SW1	SPDT Toggle
R9	10k			C9	220n	SW2	DPDT Footswitch
R10	10k			C10	47µ		
R11	12k			C11	4µ7		

The IC Chip used for this circuit is a TL074

Build Notes Part 1:

The value of capacitors C1 – C9 is not critical, any value from 220nF or higher will keep the frequency response flat – keep them all the same value. For bass guitar players values of 470nF or higher is recommended.

P1 sets the gain for the dry signal. If you wish to reduce the number of ParaMix pots from three to two, replace P1 with a wire jumper between pads 1 & 2. The gain of the dry signal is then set by R5, increasing the value of R5 will increase the gain.
The Kill Switch turns off the effects loop (Send/Receive Loop). If you do not wish to install the Kill Switch, place a jumper between the pads of SW2A, omit D2 and R17, and ignore the wiring for SW2B.

A new optional feature of the ParaMix is a set of "Insert Jacks" in the dry signal path. With nothing plugged into the IO (Insert Out) and II (Insert In) jacks, the dry signal passes directly to the mixing stage, IC1B. When an effects pedal is plugged into the IO and II jacks the dry signal passes through the effect before reaching the mixing stage. This allows mixing of 2 wet signals, instead of a wet and a dry.

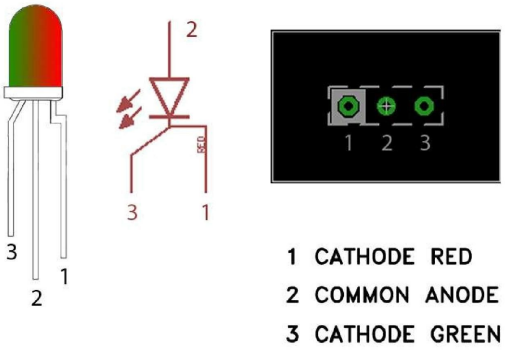
The Insert Jacks feature requires **2 mono jacks with a normally-closed tip contact switch** such as the **Switchcraft model 12A**. **- Mouser #: 502-12A**

The Tip lugs connect to the upper pads, the contact lugs to the middle pads and the ground lugs to the lower pads of IO and II. If you don't wish to install the Insert Jack feature, place a jumper between the upper pad of IO and the upper pad of II.
The correct jack must be used for the Return and Send Jacks these are mono with a contact switch. Here is another source: https://www.alliedelec.com/switchcraft-12a/70214523/

STATUS LED

D1 is a common anode bi-colour LED
The diagram above shows the pin-out, schematic symbol and pad connection for a common anode LED.

The pin-out for the bi-colour LED is as follows:
The pad for lead 1 on the circuit board is marked with a white box. When connected correctly D1 will light red when power is applied and the circuit is in bypass mode and light green when the circuit is in effects mode.



If you wish to use a standard LED the anode is connected to the middle pad and the cathode to the (non-white) pad.
If using one of GuitarPCB's 3PDT Wiring Boards pads S4, S5 and S6 are ignored, D1 and R16 are not installed. D2 is a standard LED, the cathode is marked with a white box.
The LED will light red when the Kill Switch is activated.

Build Notes Part 2:

For C1 through C9 capacitors we list 220n or .22uF however anything from 220n to 820n would be fine for Bass. Standard guitar users only may use 100n and up.
It is more a matter of what you have most of in your parts drawer.

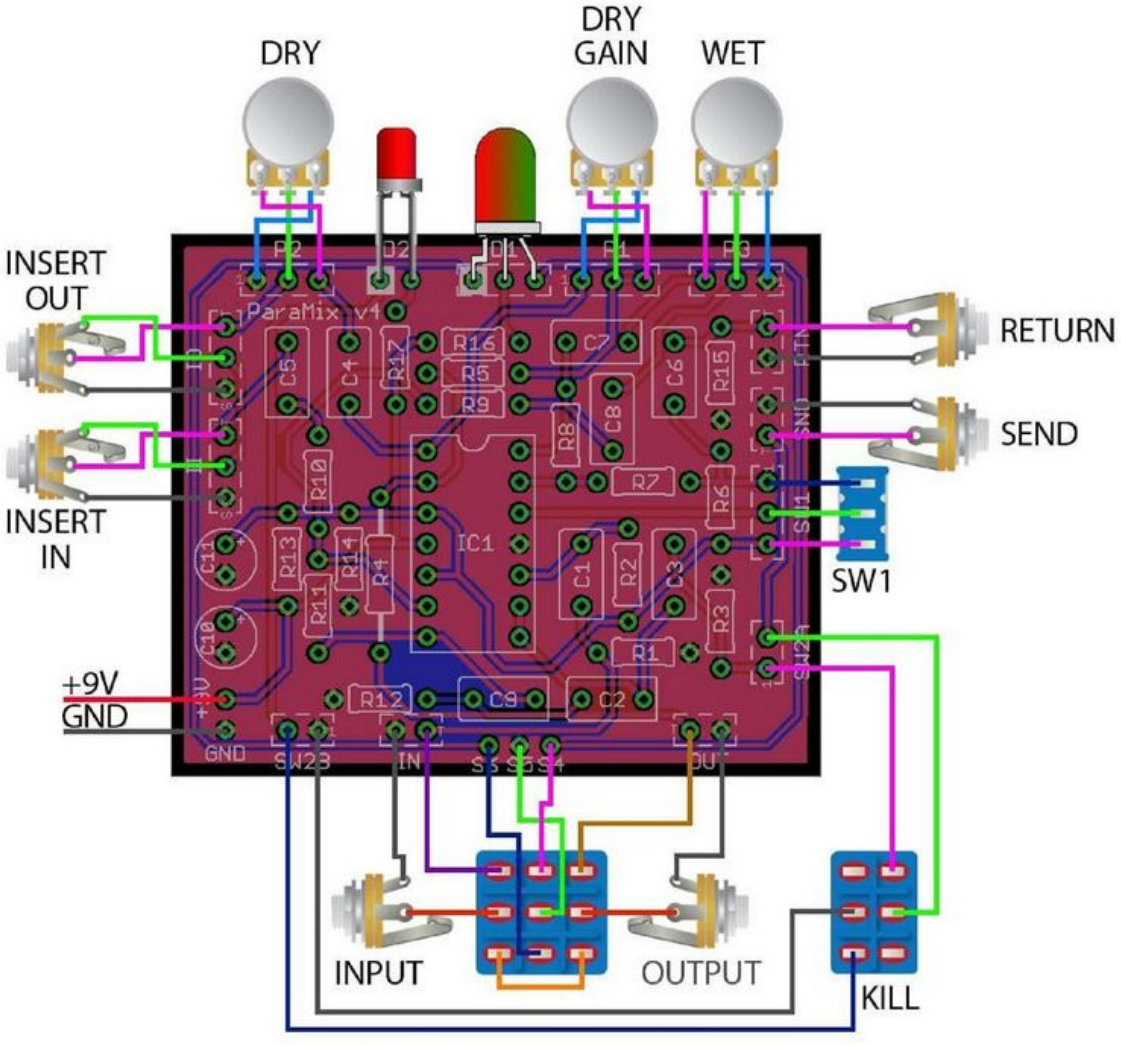
Probably my favorite is to use a delay and fuzz/distortion in the loop. This will thicken the sound. The possibilities are limited only by your imagination though.

Bass Players can use this with any DIY or Commercial Pedal and not have to worry about Modding it for Bass! Mix in as much Dry Tone as needed for Bottom end and Rock out with the bass on any pedal you like!

Set a small time delay (10mS to 30mS) and no repeats, and the effect will "sit behind"your clean signal.

How about plugging your Ipod into the return jack and mixing your Jam Tracks with your Guitar for the perfect practicing tool!

<u>WIRING DIAGRAM</u>



Usage Ideas next page: The ParaMix has six jacks:

- **IN - Input**
- **OUT - Output**
- **SND - Send**
- **RTN - Return**
- **IO - Insert Out**
- **II - Insert In.**

The input and output jacks should be obvious, connect your guitar to the input jack and connect the output jack to your amplifier.

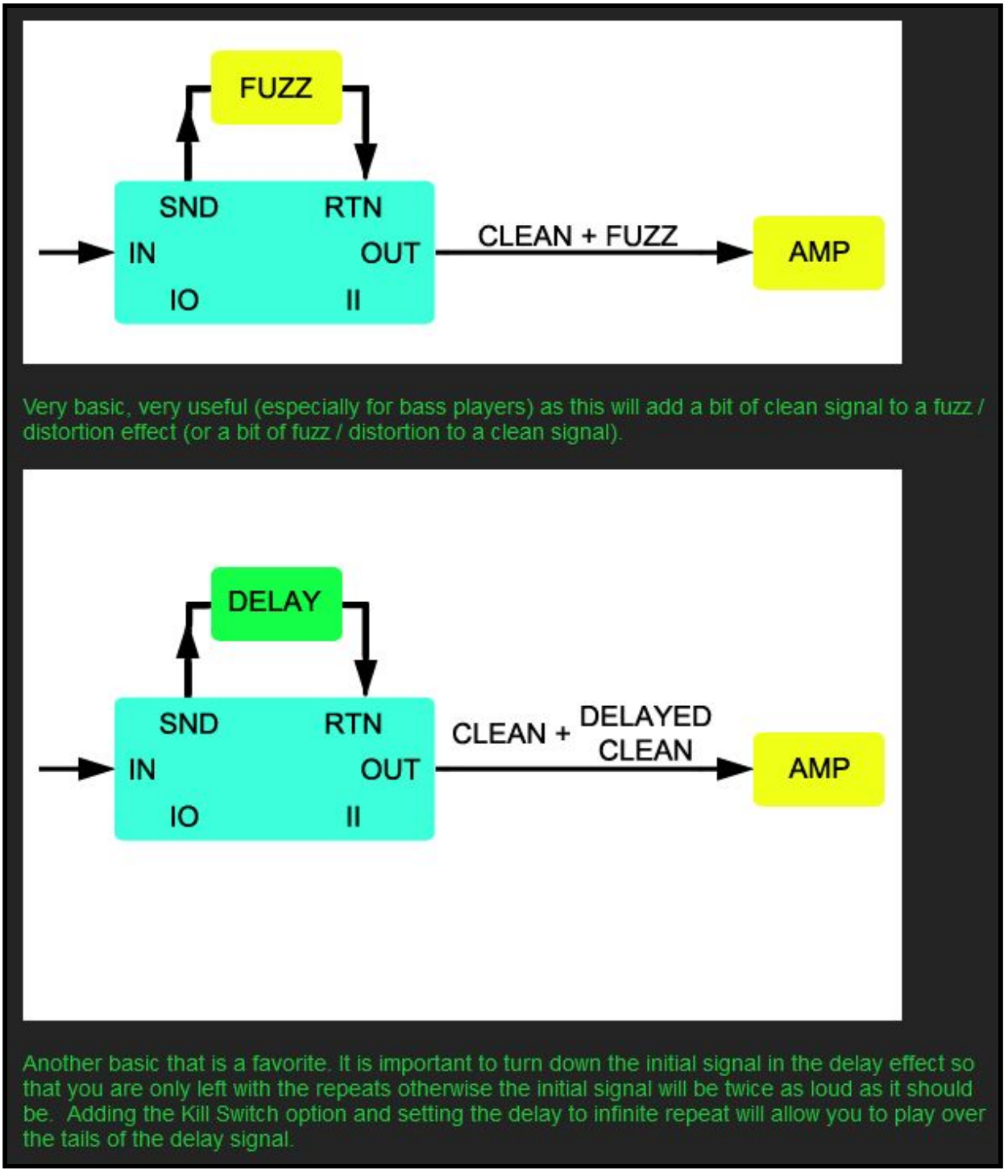
For the SND / RTN part of the circuit you plug a cable from the SND jack to the IN jack of the effect and another cable from the OUT jack of the effect to the RTN jack on the ParaMix. What you are doing is SENDING a clean signal (that's the signal from the input of the ParaMix) to the effect and RETURNING the effects signal to the ParaMix.

The IO / II part of the circuit is very similar to the SND / RTN part of the circuit except that when no cable is plugged into the IO or the II jacks the clean signal from the input of the ParaMix appears at the output of the ParaMix.

If you plug a cable into either the IO or II jack (or both), the clean signal between the input and output of the ParaMix is disconnected.

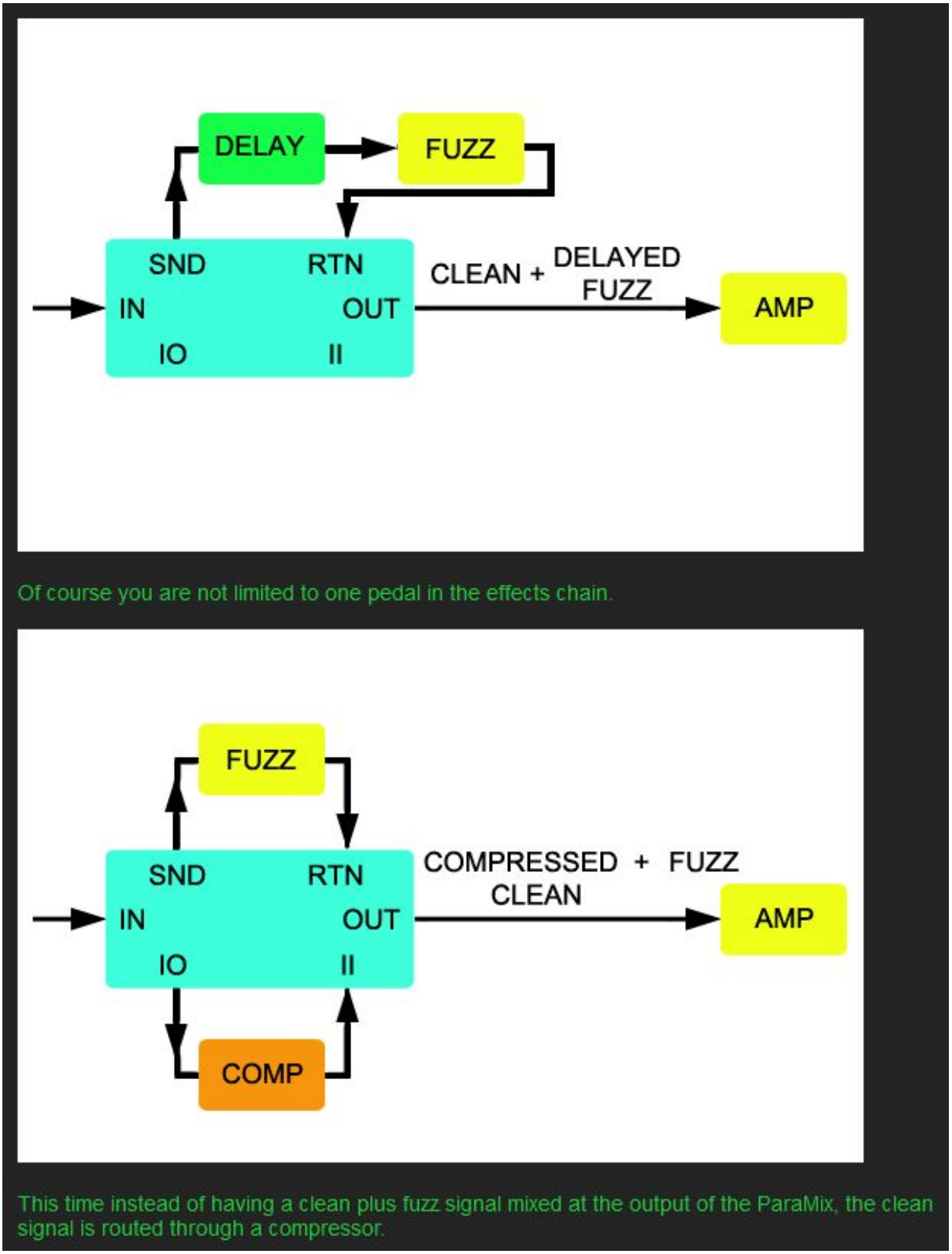
Rather than writing lots of text, some diagrams might be helpful. Please remember these are just examples, the effects that you use or find useful are a matter of personal choice.

Example #1



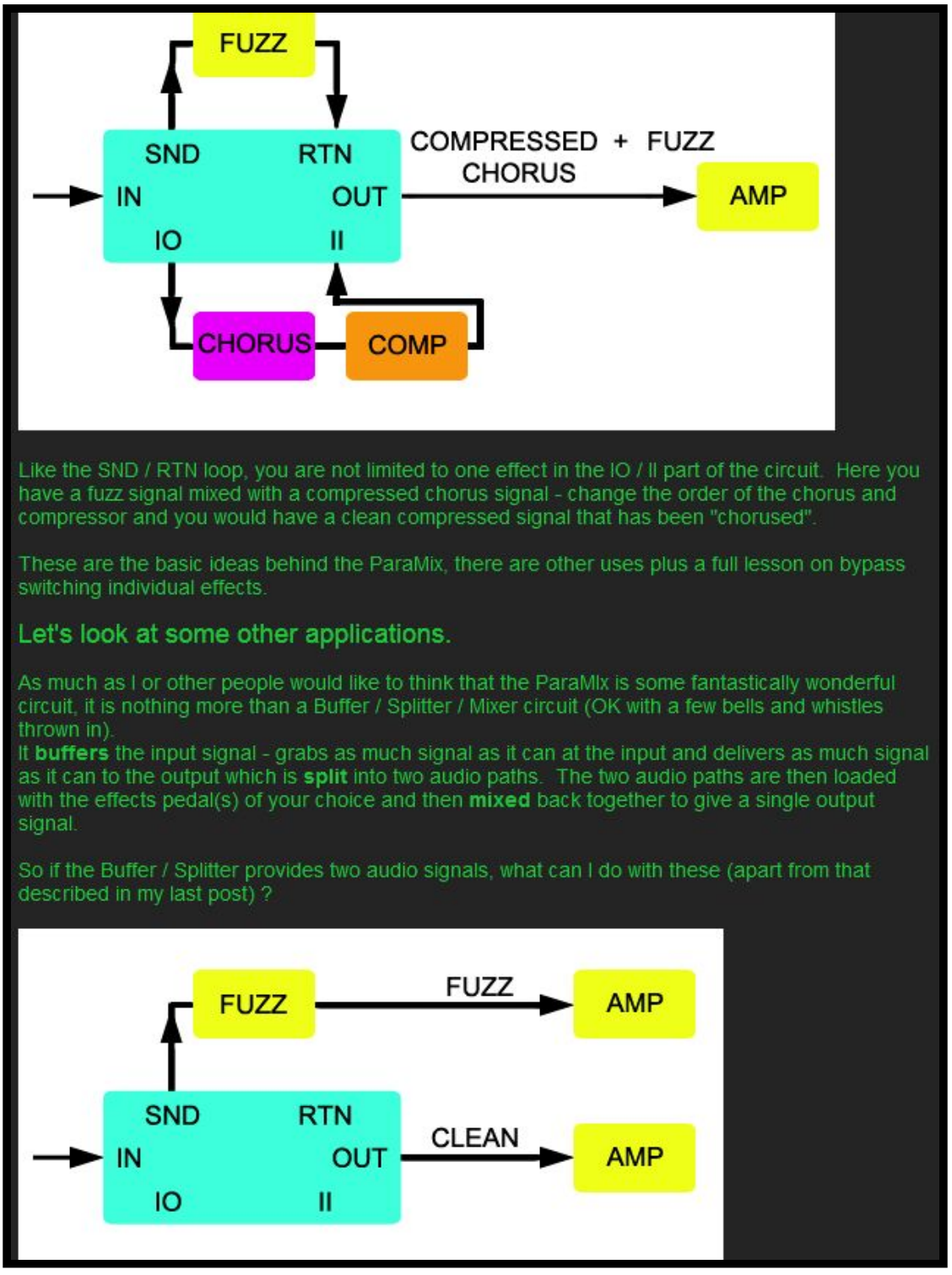
See next page for example #2.

Example #2:



See next page for example #3.

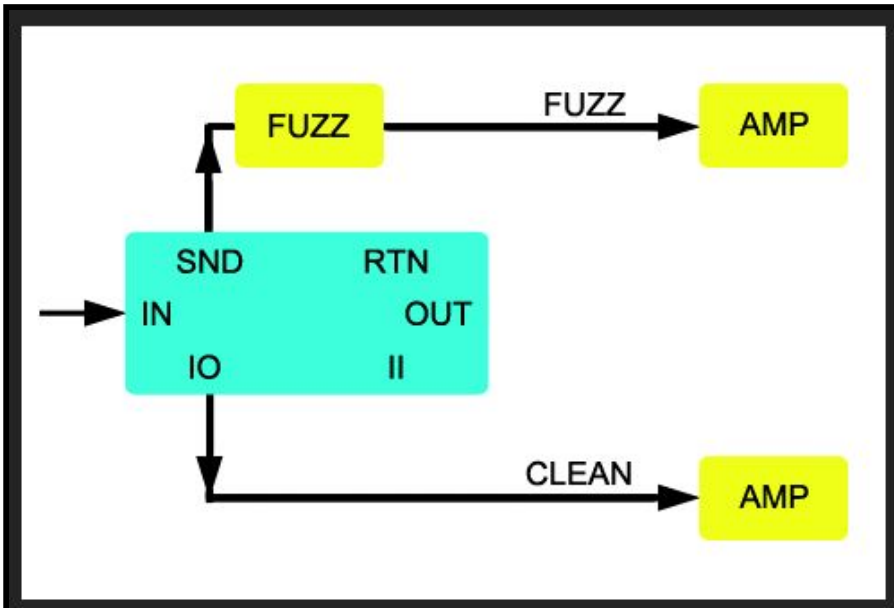
Example #3:



In the above example I can use two amplifiers :) The above diagram shows the basics, one amplifier with a fuzzed signal (remember you can use any effect or effects you want) and one with a clean signal.
With this configuration I can:

Provide both amplifiers with a clean signal by removing the fuzz pedal from the circuit either by using the fuzz pedal bypass switch or connect the SND jack directly to the amp input jack via a cable. Mute the fuzz amplifier by using the Kill Switch
Change the clean channel to an effects channel by inserting a pedal in the IO / II loop, or by inserting the pedal between the ParaMIx output jack and the amplifier input. You can then choose between clean and effects signal by using the effects bypass switch. **See next page for Example #4:**

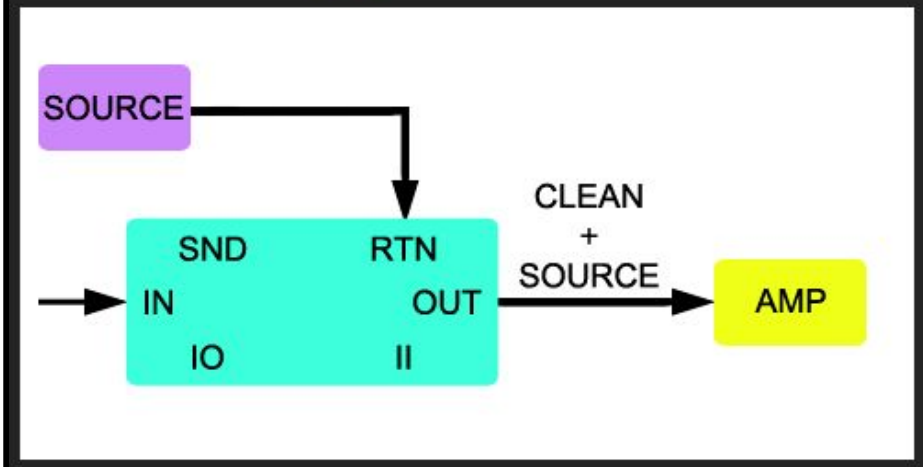
Example #4:



The above diagram is almost identical to the previous diagram. The main difference is that you can't use the IO / II loop and would have to insert your pedal(s) between the IO jack and the amplifier input.
The only advantage is that you are not using the mixing op amp in the ParaMix which would remove the theoretical mixing stage op amp noise (if any) from the input to the amplifier.

One main problem associated with using two amplifiers is that of ground loops, or hum in the guitar amplifiers themselves. This is usually down to the amplifiers and not the effects, if you are using two amplifiers I would strongly suggest at least one if not two DI boxes between the last effect output and the guitar amplifier input.

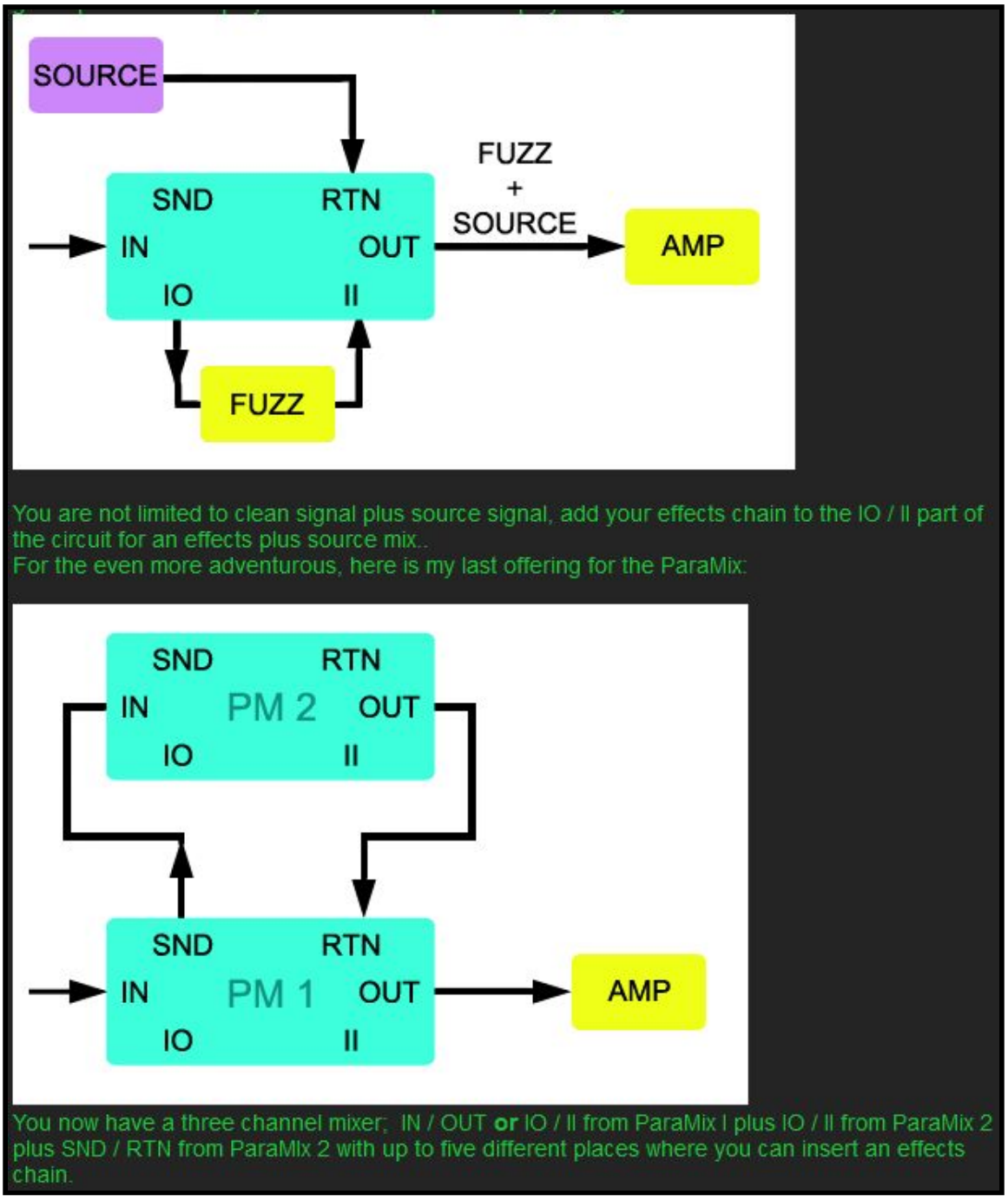
Let's now look at the mixing stage.



The diagram above shows that it is easy to mix two independent signals together and arrive at a single output.
The "Source" input connected to the RTN jack can be another guitar with or without an effects pedal chain - either you are using two guitars in a live playing situation or you are jamming with a friend. It could equally be an audio signal from your computer, iphone, boogie box, record player, gramophone record player etc to enable practice play-along.

More on the Mixing Stage Part 2 next page:

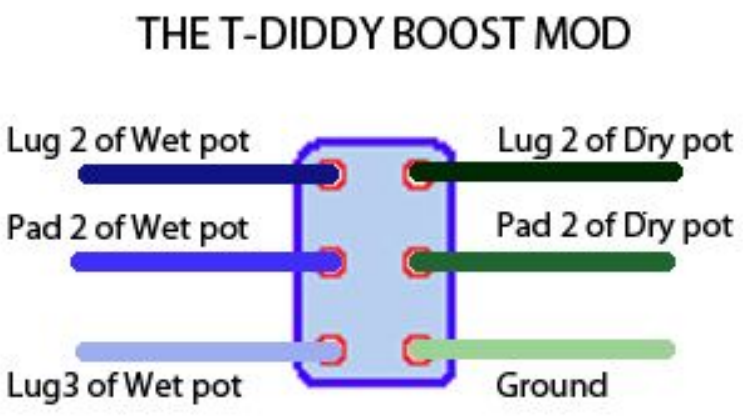
Mixing Stage - Part 2



Here is one final mod to consider based on your needs:
If you want to add a 100% Wet switch it is called the T-Diddy Boost Mod

Courtesy of Tonmann:
You can make this mod by using a DPDT footswitch- which prevents you from bending down. If you are using something like a BB enclosure it's worth thinking about whether the footswitch will fit on the enclosure - either a larger enclosure or a separate dedicated ParaMix pedal for this function (a man can't have too many ParaMixers).

Since a picture is worth a thousand words (see next page)..



When the switch is in the Up position the pads on the board are connected to lugs 2 of their respective pots - the circuit behaves as normal. In the Down position, the dry signal is connected to ground and the signal doesn't reach the mixing stage. For the wet signal the pad is disconnected from lug 2 of the pot and connected to lug 3 of the pot - as if the wet pot is turned up fully.

If you want LED status switching, you would need a 3PDT switch.

The only problem I can foresee is popping when you switch - shouldn't happen, but it might.

<u>Some additional Troubleshooting points if needed Courtesy of Tonmann:</u>
Voltage measurements will tell you where the problem is or isn't, unless you are good at electronics they won't tell you which component is causing the problem. The second part of fault finding is measuring resistances to find short circuits, open circuits and correct resistor values.
There are a few points to bear in mind before you start to measure resistances:

Physically remove the power supply / battery from the circuit and wait a few minutes to allow any large capacitors to drain to ground. Never measure resistances in the circuit with power applied, you will more than likely destroy your DMM at worst or have to replace a fuse at best.

Remove all active components (ICs, transistors and diodes) before you start measuring. Your DMM uses an internal voltage when measuring resistances, this voltage could turn on transistors and diodes which will give you a false resistance reading.

Knowing what resistance value to expect between two points in a circuit is not very difficult, the hardest part is if you have more than one path running between two points in the circuit - instead of simple resistances in series we now have resistances in parallel which takes a small amount of maths to calculate.

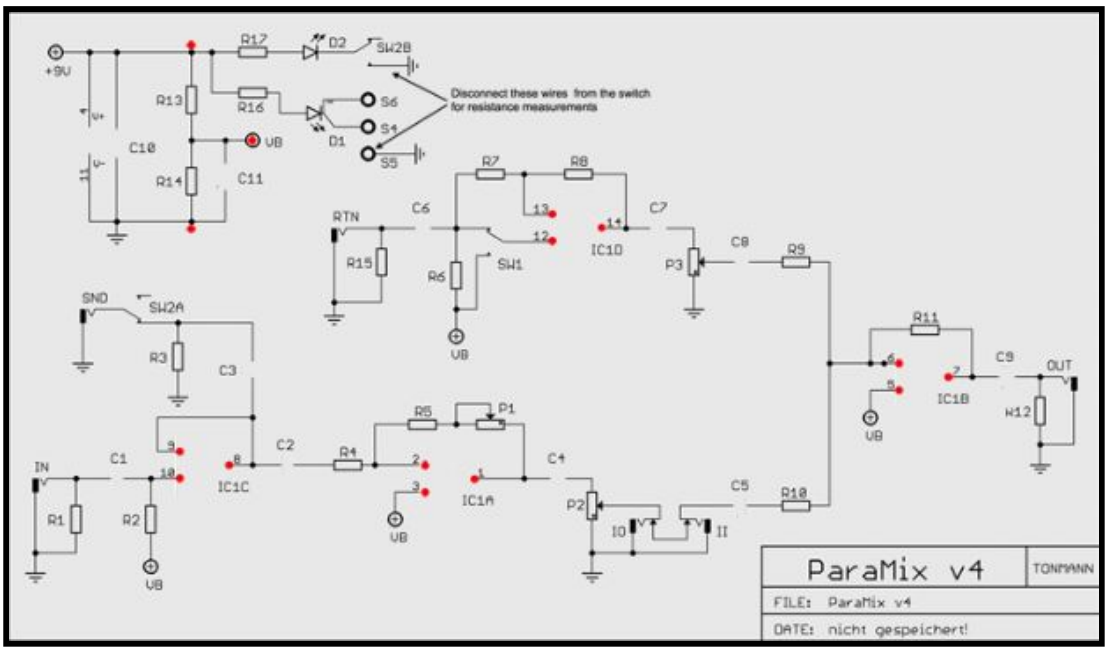
An easy method to get things right is one I have used ever since I started electronics:

- **Print a copy of the schematic**
- **Erase the active component symbols from the schematic (you have removed the components from the board)**
- **Erase all capacitors from the circuit - DC voltage won't "pass" through capacitors so for all intents and purposes they act as a break (open circuit) in the path.**
- **Look for multiple paths between two points in the circuit - use a pencil to mark the paths between two points**

Troubleshooting next page:

Shown is our "resistance" schematic for the ParaMix. As all circuits are different there is no actual one method to use so we will just run through how we should measure the resistances for troubleshooting.

(next page)



Check VB supply: Measure from the top of R13 to the bottom of R14 - which is ground (you can do this on pins 4 & 11 of the IC).
Expected value is R13 + R14

Pin 10 to VB - I can use any VB on the circuit; the top (layout) lead of R13, pin 3 or pin 5.
Expected value is R2

Pin 9 to Pin 8 - connected together.
Expected value is 0Ω

Pin 10 to Pins 9 / 8 & 11 - checking for solder bridge (short circuit)
Expected value is infinite Ohms (open circuit) for pins 9 /8 and R2 + R14 for pin 11

Pins 3 & 5 to VB - between the top (layout) of R13 and both pins.
Expected value is 0Ω

Pin 2 to Pin 1 - depends on rotation of the pot
Expected value is either R5 + P1 or just R5

Pin 3 to Pins 2 & 4 - checking for solder bridge
Expected value is infinite Ohms for pin 2 and R13 for pin 4

Pin 5 to Pins 4 & 6 - checking for solder bridge
Expected value is R13 for pin 4 and infinite Ohms for pin 6

Pin 6 to Pin 7
Expected value is R11

Pin 7 to Pin 8 - checking for solder bridge
Expected value is infinite Ohms

Pin 12 to VB - depends on the setting of SW1
Expected value is R6 in up position and 0Ω in down position

Pin 12 to Pin 13 - depends on the setting of SW1
Expected value is R7 in up position and R6 + R7 in down position

Pin 12 to Pin 11 - checking for solder bridge
Expected value is R6 + R14 with SW1 in up position and R14 with SW1 in down position

Pin 13 to Pin 14
Expected value is R8