Dunlop GCB-95 wah pedal

Before 1990, all Dunlop wah pedals had wires between the jacks and the pcb. In mid 1990 Dunlop changed the pcb design, and started soldering the jacks directly on to the circuit boards. If your wah has pcb jacks, it is marginally more difficult to mod for true bypass, as you have to cut a trace on the pcb (instead of moving a cable, as before). Also, from mid 1991 onwards, a buffer circuit was added before the actual wah circuit (it's there if your pcb says "Rev F" or higher on it), to help with some of the tone-sucking. The buffer is no longer needed if you mod the wah for true bypass, and removing it will make the wah a little smoother. The current revision is Rev G, which has been in production since mid 1992. Rev F, which appeared a year earlier, had a different adapter jack, but that's the only real difference between the two. This page deals mainly with the modern incarnations of the Rev G circuit, but will also apply to Rev F pedals. Rev E units have a slightly different layout, and have a special section below.

Important note: In these instructions I refer to "upper", "lower", "north" and "south". To avoid misunderstandings, you need to orient the pcb accordingly - the "top" or "north end" of the pcb is the one where the 8-pin connector is. Also, even though connections are made on the underside (trace/soldering side) of the pcb, directions like "to the left of..." or "just above..." refer to the front or component side of the pcb. Also, there are two different inputs being mentioned - in step 2 the "buffer input cap", and in step 2b the "input resistor". It is a little confusing, but the buffer circuit is a separate circuit that has been added to the existing wah circuit. The buffer therefore has its input (the capacitor), which then feeds the wah circuits' input (the input resistor).

step 1. disassembling the wah

Take the back plate off the wah by removing the 4 rubber feet and remove the battery. Unscrew the input/output jack nuts from the sides [tip: for Dunlop wahs, use a 7/16" socket], then remove the 8-pin connector at the top of the pcb and the single screw that holds the pcb down. Now gently take the pcb out from the casing - it's a tight fit, but it'll come loose. Sliding it downwards (away from the pot) usually works for me.

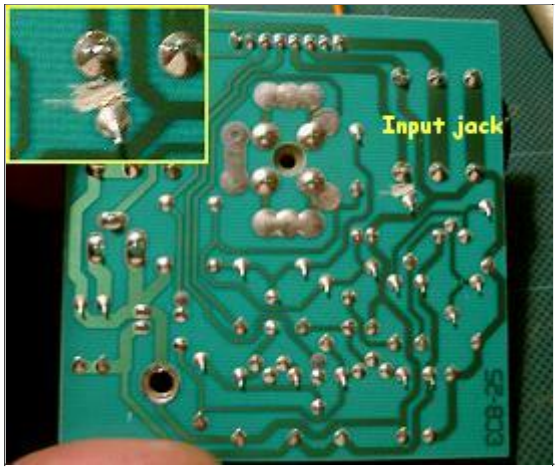
step 2. mods to the pcb (Rev F & G)

Start by deciding if you want to remove the buffer or not. I'd recommend you to remove it - you'll take a transistor and a bunch of other components out of the signal path, and that can't be bad. But it's your call - leaving it in won't make the wah sound any worse than before. Taking it out will however change the sound slightly. To the better IMO, but still a change.

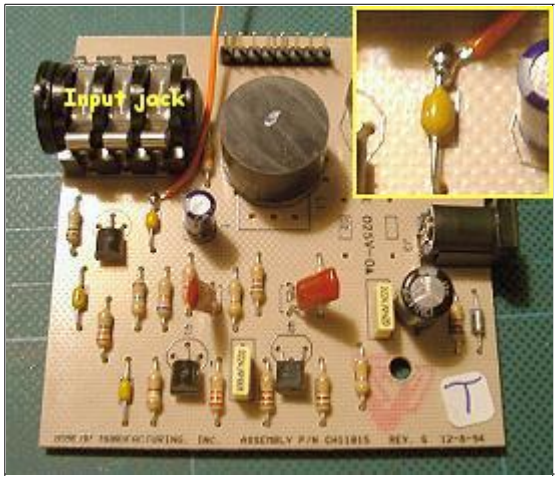
If you decide to keep it, follow the instructions below. If you want to remove it, see the next page.

Take a good look at the pcb - yours may look different from this one, but the general layout is the same. You'll see that the input jack has six solder points. Only one of them carry the hot signal when there's a plug in the jack - it's the innermost one in the lower row. From there the signal flows two ways:

1. Downwards via a short wide trace to the first buffer component (it is a capacitor, even though it looks like a small yellow blob in the pics).
2. Upwards via a long, narrow trace to the 8-pin connector. This trace then turns into the green wire, ending up at the switch.



You want to keep trace 2 intact, and break trace 1. With a sharp knife, carefully cut trace 1 between the input jack and the buffer input capacitor. In the pic the place to cut is marked with a white line.

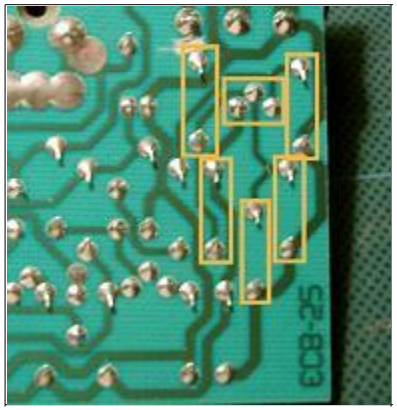


Cut yourself a piece of wire (thin, flexible multi-strand) that is long enough to easily reach the switch from the pcb. About 15 cm (6") is a good length. You'll trim it to length later, but you will kick yourself if you've made the wire too short... Then carefully solder the wire directly onto the north end of the buffer's input cap (it's right below the white line in the pic). Just slide it in under the capacitor's leg, pull it up and back over said leg. For neatness, you can tuck the wire strands in under the capacitor leg, using a small flat-head screwdriver. When the wire is properly seated, slide it as far from the cap as possible (to avoid overheating it) and apply solder. This wire is now your new effect input.

That's it! Proceed to the switch if you haven't changed your mind about removing the buffer.

For Rev E wahs, the above procedure is the one to use. The difference is that the buffer circuit isn't there, so you have to locate the trace to cut yourself. The input jack is in the same place, though, so you should be able to find it fairly easy. The first component - which is where the orange wire is then soldered - is the 68K (blue-grey-orange) input resistor.

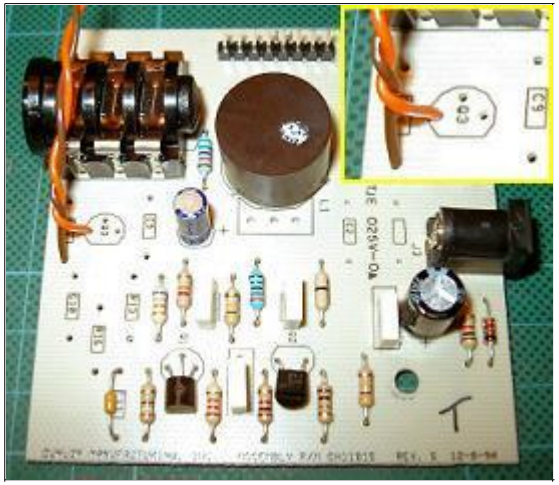
step 2b. mods to the pcb incl buffer removal (Rev F & G)



With the pcb out, take a good look at it and compare it to the one in the pic to the left. The buffer components are the ones crossed over with red X:s. It should be six components in all (including the transistor). You don't have to cut any traces - maybe one day you'll want to use the buffer section again, who knows? Besides, the missing components make a fine "cut" all on their own, so there's no need to be violent. I use a desoldering braid or a "solder sucker" to remove the solder, and a pair of flat-nose pliers is also nice to have for quick and easy removal of components. Don't jumper anything - just leave the holes as they are.

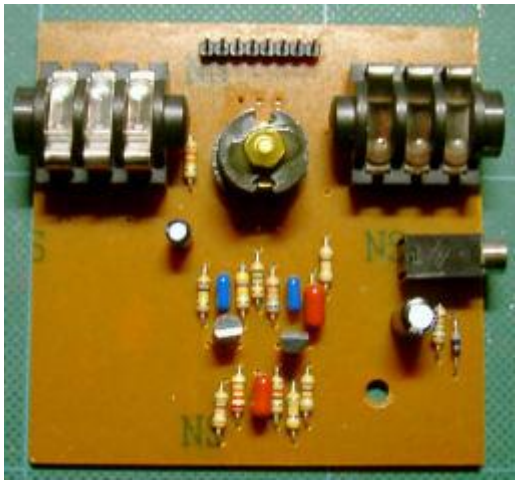
Cut yourself a piece of wire (thin, flexible multi-strand type) that is long enough to easily reach the switch from the pcb. About 15 cm (6") is a good length. You'll trim it to length later, but you will kick yourself if you've cut the wire too short... Then carefully solder the wire in the far left hole (as seen from the component side) of the three vacated by the transistor. If you follow that trace you'll see that it ends up on the north side of the 68K input resistor. This wire is your new effect input.

In the picture to the right, the orange wire is the effect input. The brown wire is a ground wire from the switch (more about that later). You don't have to solder the ground wire in this place, or twist it together with the input wire - I just do that because I like things neat... But again - more about the ground wire later. For now, just remember that the effect input wire goes in the transistor's far left hole.

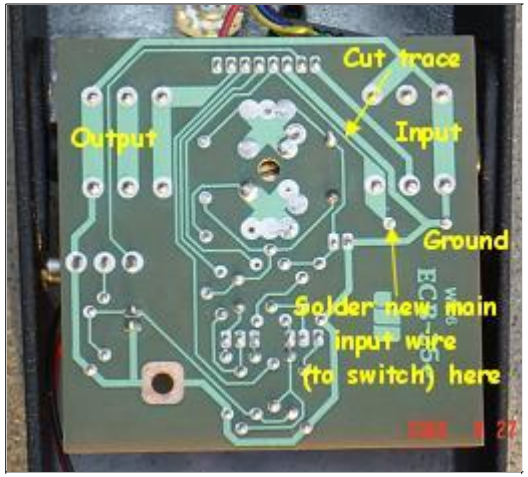


step 2c. rev E wahs (1990)

Thanks to Erik for the solder side pic!



The first year the pcb mounted jacks appeared, the circuit was laid out differently compared to later models. If your pedal looks like the one in the pic (pcb colour may differ, but look at the component layout), it's a Rev E pedal. You will need to cut a trace on these pcb's too, and we will also alter the wiring slightly. Instead of leaving the input jack -> 8-pin connector trace intact, we will break that connection and use the wire in the harness as the "effect input" wire.



Cut the trace between the input jack and 8-pin connector. It's a fairly long trace, and you can cut it anywhere you like between the point where it becomes thin and where it meets the 8-pin connector. But be careful - it does sit a little close to its larger neigbour, so you can't exactly use a hacksaw... When that is done, you need to cut a piece of wire about 15 cm (6") long, and solder it to the pad right below the input jack (you may have to desolder the pad first). This is your new main input wire. The green wire in the 8-pin connector has now become the input to the circuit instead.

For the switch wiring detailed below, treat the green wire as the effect input, and the new wire you just added as the main input (i.e. the exact opposite of how you wire newer GCB-95's).

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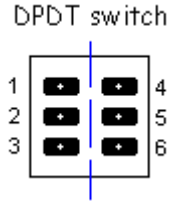
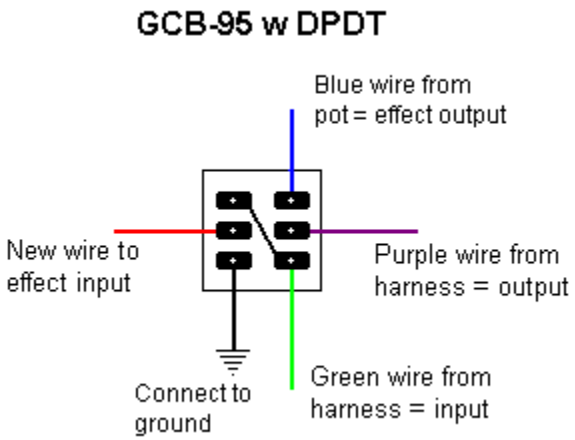
step 3. the switch



You need a good quality DPDT (double-pole, double-throw) switch. We will wire it in a way that combats crosstalk (when the effect can be heard faintly even in bypass mode), switching noise and clicks. Most switching noises come from the effect input suddenly seeing infinite impedance when it is disconnected and left wide open in bypass mode. This way of wiring the switch (which I believe Jack Orman is the father of) shorts the effect input to ground in bypass mode, making it shut up. End result? No crosstalk in the switch (as there's no signal to overhear) and tiny or no switching clicks. I often use an Apem switch from ELFA (www.elfa.se/) (part #: 35-761-47) because it's small and neat, but mostly because it’s readily available here in Sweden.

Another option is Banzai Effects at www.banzaieffects.com/europe/partshop.htm in Germany - Olaf sells DPDT, 3PDT and even 4PDT switches, and for us europeans it can be both easier and quicker to order from within the EU. Also, you can buy both DPDT and 3PDT switches from Stuart Castledine of www.wah-wah.co.uk/ , as well as from Andi Allan at MonkeyFX www.monkeyfx.co.uk/ . Both are in the UK, and are very good chaps to deal with. Outside Europe, I shop from Aron Nelson of www.diystompboxes.com/pedals/index2.html , who will happily sell you 3PDT switches at very decent prices, and Steve at Small Bear Electronics at www.smallbearelec.com/ .

Anyway, a DPDT switch consists of two SPDT switches side by side (if you bought a 3PDT instead, just ignore the third row of soldering lugs). The two halves (as marked in the graphic) are independent, but both poles move in the same direction. This means that when switch A's pole (#2) connect to throw 1, switch B's pole (#5) connect to throw 4. Click the switch and pole 2 makes contact with throw 3 instead, while pole 5 connects to throw 6. Read this article: www.geofex.com/Article_Folders/bypass/bypass.htm by R.G. Keen if you want to indulge yourself in all things switching... The actual wiring of the switch is easy, if only a bit finnicky. It requres moderate soldering skills, but you'll be fine. Just don't warm the lugs too much - you can melt the switch if you are too slow. As with any soldering be decisive and quick.



1. De-solder the connections on the old switch and remove it. Install the new DPDT switch and check that it fits and will work as intended. You should barely (if at all) be able to make it switch over when pressing the rocker pedal down by hand - using your foot and body weight will then compress the rubber stops enough to activate the switch.

2. Remove the switch and install a jumper wire between lugs 1 (top left) and 6 (bottom right) on the switch. Only solder lug 1 for now (tip: a cut-off leg from a resistor works great as jumper wire).

3. Reinstall the switch and solder the new wire you previously installed on the pcb to lug 2 [lug 6 for Rev E wahs]. Another new wire goes from lug 3 to ground. Any point that makes contact with either the pcb's ground or the wah case will work. One of the lugs on the pot has a black ground wire connected to it - you can try soldering to that point. Or draw the wire all the way back to the pcb (like the brown wire in the pic shown earlier). Anyway, this connection will short the wah input to ground in bypass mode, which more or less eliminates cross-talk and switching noise.

4. Solder the blue wire (coming from the pot) to lug 4, the purple (coming from the 8-pin connector) to lug 5 and finally the green (also from the 8-pin connector) to lug 6 [lug 2 for Rev E wahs]. Note: some wahs (mostly newer ones with the Hot

Potz II pot) have two blue wires soldered to the switch. If so, solder both to the new switch as well.

5. You're done!

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modding the wah circuit itself

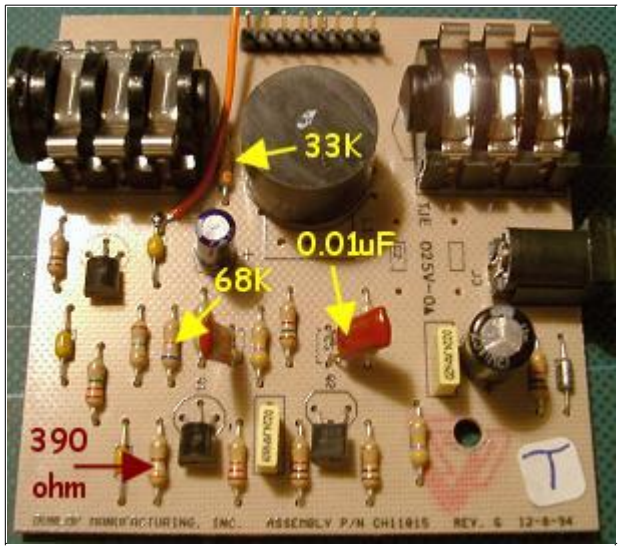
There are a million modifications that you can do, of course, but some are more useful than others. Here are a few (pic below):

- **"Easy" range adjustment:** Takes some of the shrill highs out of a Dunlop Crybaby. This one requires no soldering skills at all, and I regularly do it to many of the wahs I service. To lower/raise the working range slightly, set the wah on a table, face down with the battery end towards your gut, and press the pedal down to the stop. Remove the bottom plate and locate the toothed bar that turns the pot axle. Move the treadle up/down a few times, to familiarize yourself with which way the pot turns as you press the treadle down towards the toe end. With a phillips-head screwdriver, remove (or just loosen it enough to turn it sideways) the white plastic flange that presses the toothed bar against the pot axle gears, and release the bar. Now you can manually turn the pot one or two notches back. Viewed from the battery

end, you turn the pot towards you (it's clockwise, if you view the pot assembly from the left). There is room to safely adjust it two notches or so before the pot runs out of play.

- **Gain mod** Removing the buffer can make the wah quieter, and there are two ways to combat his. Either replace the 68K input resistor with a lower value (like 47K) or lower the value of the 390 resistor to something between 270-330Ω (which will also give more bass). Remember that the Vox wahs use a 490Ω resistor instead of the Dunlop's 390Ω, and it sounds just fine. Some Dunlop wahs also use values between 470-510Ω. So try yours with stock resistors first - you might not need more gain after all. Mine didn't, possibly because I also did the vocal mod.

- **Vocal mod:** Replace the 33K resistor in series with the inductor with a higher value, like 56 or 68K. This will make the resonance peak of the circuit sharper (with a smaller "Q" value), which in turn makes the "wah" sound more like "woh".



- **Adjustable:** replace the 33K resistor with a suitable high-quality trimpot (something like 100K lin) - then you can tweak the wah/woh all day... Do the same with the 390Ω resistor (a 500Ω or so linear will work fine) to get adjustable gain/bass response. Just remember to set them to the correct value before installing, so you'll know where you are when you start. Some prefer soldering the trimpot in series with the existing resistor, which will guarantee that you never adjust it below the original value. Personally I'm not bothered by that, as an internal trimpot rarely gets adjusted by mistake.

- **Lower range:** The 0.01uF cap controls the frequency range. A lower value shifts the wah higher in frequency, while a higher value lowers it. To shift the wah downwards (using more of the woofy bassy wah sounds), try a 0.022uF cap here. If you come across a bass wah cheap, buy it - you only need to change this cap to turn it into a guitar wah (or the other way around)! The standard bass wah uses a 0.068uF cap in this position. (Thanks to Matt Parlane for providing the bass wah value.)

- **Mid boost:** Raise the value of the 1.5K resistor (located to the left of the 0.01uF capacitor). A 2.2K reistor here will give you a bit more mids, while smoothing out the transition from heel to toe position.

http://members01.chello.se/pastorn

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