Improving the gearshift feel in an SW20.

In 3 parts.

Part one

The SW20 gearshift can be often be greatly improved by eliminating play in the shift linkages, and this article covers three areas that need to be checked to achieve this.

First of all we will deal with the cables at the gear lever end.

To gain access here only requires the removal of the gear knob, gaiter, and gaiter surround that simply un-clips.

In my car, I discovered a small amount of play in the rose joint where the cable connects to the gear lever.

I realized that any play in this joint would be magnified by a factor of three at the end of the gear knob. (The distance from the bottom socket of the gear lever to the Rose joint attachment point is about half the distance from there to the top of the gear knob).
There was virtually no play in the other cable end connection, which is activated by sideways movement of the gear lever, so I didn't worry about it.

I fitted a replacement rose joint, and gained a more positive gearshift feel with less slack by simply replacing this one part.

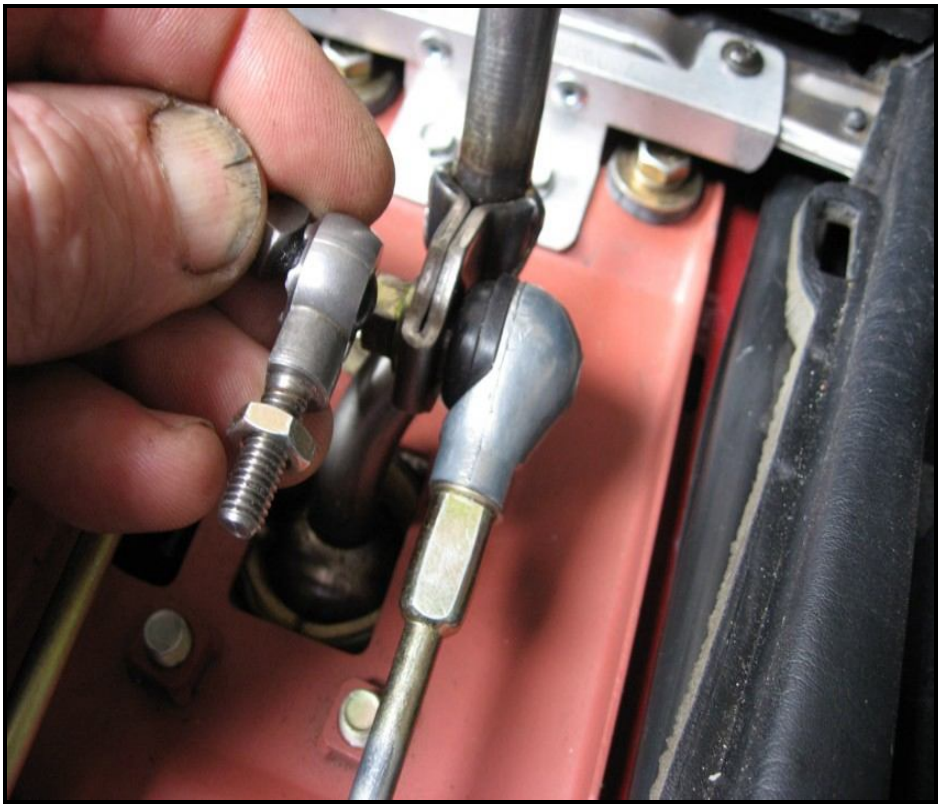
My local Toyota dealer told me this rose joint was not serviced separately.
Apparently you have to buy the whole damn cable to get it, but it may be worth checking with your local dealer anyway.
So I had to look for a non-stock one and eventually found one to do the job, but it needed some modification to be able to fit it.

In my search for a suitable part I saw the same rose joint as the one that I used at 3 different bearing places, so these should be readily available for anyone who wants do the same mod. It cost me about $25.

In the next picture below, you can see the stock rose joint, compared to the larger modified one that I fitted.

The position of the locknut on the old rose joint gives an indication of where the cable end came to.
Because it was larger, the new rose joint needed to be shortened and fitted to the cable without any locknut to maintain the right overall cable length.

I found the overall cable length is not all that critical however, as long as the gear lever sits close to vertical when in neutral.



Shown below is another pic of the stock Toyota part.
It has a 12mm male thread that fastens to the lever and a 10mm male thread that screws into the cable and is held with a locknut.

But you'll find that most rose joints you can buy will have the same size thread at both ends, as was the case with the one I chose for the job.
It had a 12 mm male thread at one end that fitted the gear lever ok, but the <u>12mm female</u> thread at the other end was unsuitable because a <u>10 mm male</u> thread was needed to fit the thread in the cable end.

So I first cut a small amount off the 12mm female end of the rose joint, to end up with the right overall cable length as mentioned above.
I then fitted a threaded reduction bush made from a 12mm bolt by drilling and tapping the center to 10mm.
I then inserted a 10mm stud (made from a tensile bolt) that extended out approx 15 mm to allow it to screw into the cable connector without any locknut, problem solved.

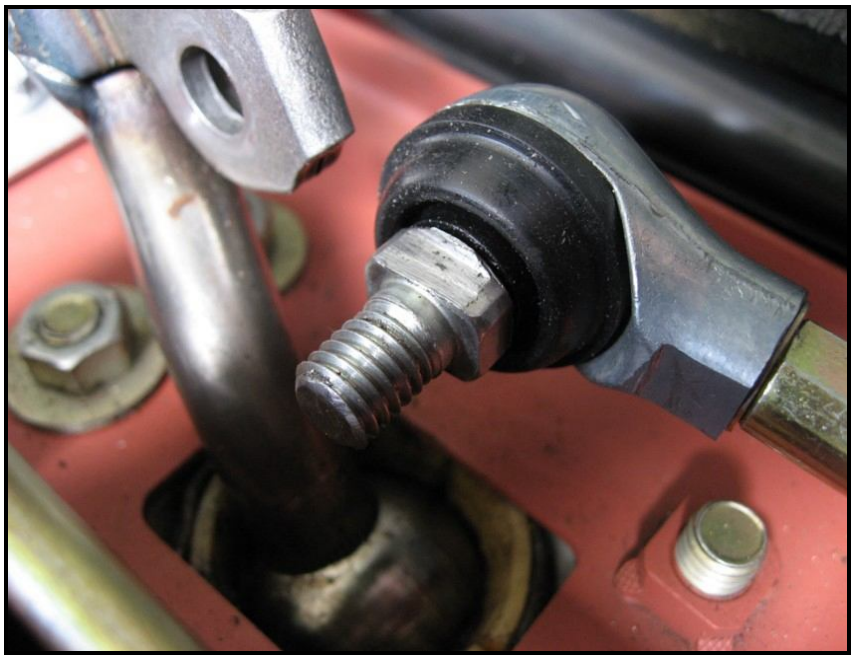
Making the threaded reduction bush can be done with a basic drill press and drill press clamp, but care is needed to drill the tapping hole concentric. While not impossible, you could do the job with a hand drill.

The only other thing I had to do was grind a couple of flats on the 12mm bolt flange to locate it properly on the gearlever, and a couple of flats on the rose joint body so I could use a spanner to screw it to the cable. I also fitted a spacer sanded to exactly the

right thickness to get the correct alignment to the gear lever when it was all tightened up, thus eliminating the need for a locknut.

To hold the reduction bush and stud in the rose joint I used red Loctite, and where it screwed into the cable I used blue Loctite. Red is forever, and blue you can take apart.

The picture below shows a closeup of the new rose joint about to be connected to the gear lever. You can just spot the special thickness washer between the cable end and the rose joint.



Replacing this one part made a noticeable improvement to the shift feel.

Other parts to look at are covered in parts 2 and 3 of this article.

Ian Morrison.

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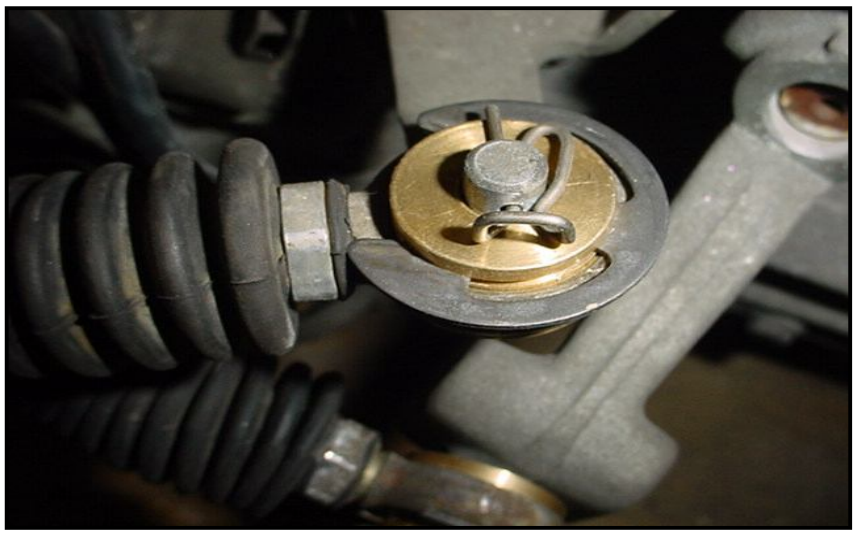
Part two

As I pointed out previously, any slack in worn cable end bearings is going to be magnified three times at the end of the gear lever.
Here, I describe how I updated both cable end bearings in my car **at the gearbox end,** which, combined with the new rose joint at the gear stick end, made an even greater improvement in shift feel.

The picture below shows the old Toyota OEM bushes that I removed from my car.

Apart from fitting new stock parts, there are 3 other options that I know of for updating these bearings.

For some time one popular alternative has been to fit custom **solid brass** bushes that give a firmer shift feel, and kits are still available from several vendors.
The next picture (taken from the Twos R Us website) looking down into the engine bay shows a set of them fitted.



Another more recently available option for the cable ends is **s**pherical **rose-joint** type bearing inserts, but I have not used these personally.

Their main feature is that they allow for movement in the cable end connection in all directions, which is claimed to create less stress on the cable.
They cost about the same as solid brass bushings, and are available from various sources as a kit that includes all clips and spacers needed.

Alternatively, you could fit sealed ball races, as shown in the next picture, readily available from any bearing place. You will also need some washers to center them on the shaft.

This was the option that I chose for my own car, and would be **by far the cheapest**, as it only cost me $10 for the 2 bearings. When I was buying them the guy just grinned and asked, “Are you fixing you skateboard?” I answered, “No I’m fixing my mr2”.

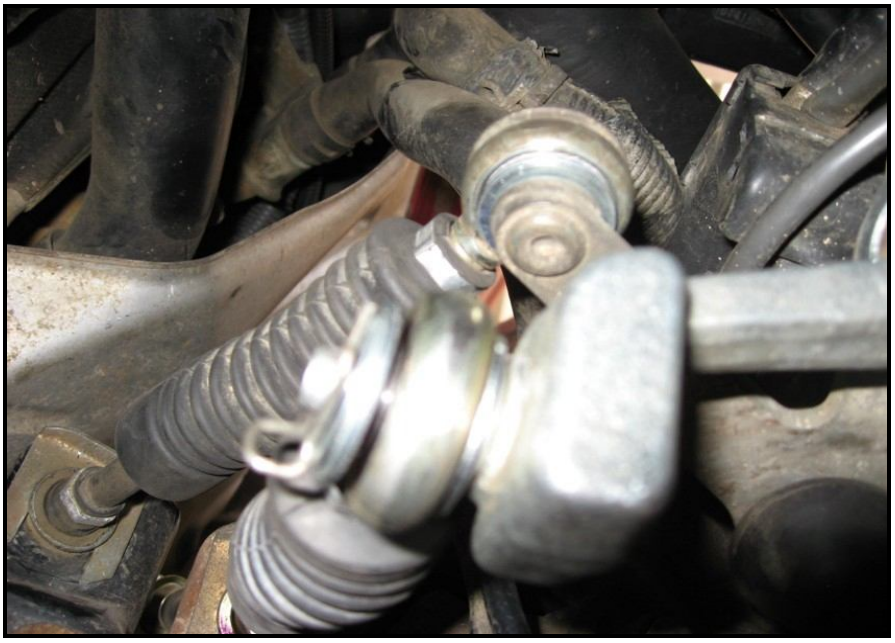
As for wear and tear and how long they last, only time will tell, but I have had them in now for about 30k kms with no problems.

If you go for the sealed bearings, you’ll need to buy two, 8mm inside, 22mm outside, 7mm wide, (the same as used in skateboards) and obtain some 8mm (5/16) washers, similar to those in the above picture. I used 4 small (15mm OD), and 4 large (22mm OD), plus a few extra for eliminating side play, as I will explain later.

Rather than trying to fit these from the top of the car reaching down into the engine bay, I decided that it would be much easier to do the job from underneath the car.

To do the job the tools needed are, 10mm socket/wrench, pliers, screwdriver, and a “C” clamp. You will also need the means to raise the car up high enough and properly supported, to work underneath.

I will assume people reading this will know how to avoid the dangers of working underneath a raised car. Don’t attempt it unless you know how to do it safely. (Always use jack stands etc, and never get under a car supported by a jack alone.)



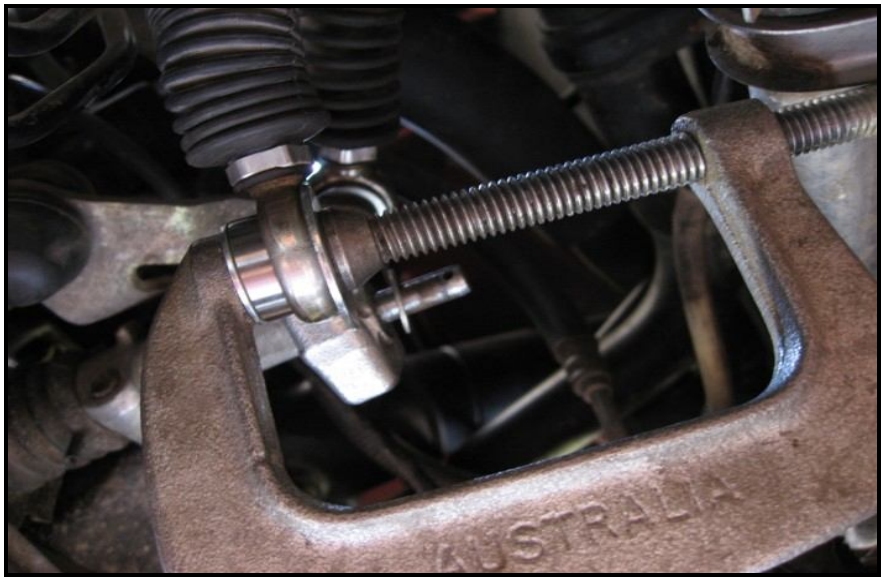
Under the car, to start, you'll first need to remove the small plastic air scoop if you have one fitted, to allow better access.
Shown above is the view from underneath. You can see the top cable, (sideways movement of the gear-lever), and the lower one, (forward and back movement of the gear-lever).

Remove the clips using a screwdriver and take both cable ends from the shafts.
The old bushes can be easily removed from the cable end housings, by inserting a suitable screwdriver and twisting firmly while gripping the cable end securely. The old bush should pop out.

The new ball race should be an "interference fit" in the housing, and needs to be pressed in with a "C" clamp. You probably won't be able to press them in by hand.
Line up the bearing so it's completely square to the housing, (You can use the shaft of a 5/16 drill to help do this) and press firmly with your fingers. The bearing should stick there until you can position two of the large sized washers with the "C" clamp.

Make sure the bearing is still square to the cable end housing, and tighten the clamp until the bearing is pressed right in to the center of the housing. It should go in easily without much trouble.

The next two pictures show first, the cable end with a bearing about to be pressed in (with the help of the "C" clamp and washers), and then the cable end with a pressed in bearing, ready to be fitted to the shaft.



Below is an end view, showing the washers. I used six altogether on each cable, but this could vary depending on the thickness of the washers you use.

When both cable ends are fitted, and their holding clips inserted, you only need to refit the air scoop and lower the car. Job finished.

For anyone wondering how these work on my car, the answer is simply brilliant!!

Compared to the old OEM rubber bushes, the gear lever now feels easier to move into the different gears with noticeably less slack. It also feels firmer with no apparent vibration, and I don't believe I would have got this firmer feel by fitting new rubber mounted OEM bushes.

Over all, I was surprised how much difference this modification made, because my original bushes were not all that badly worn. Well worth the trouble for such a small investment, and so easy to fit.

In part 3 to follow, I describe another area to check for even more improvement.

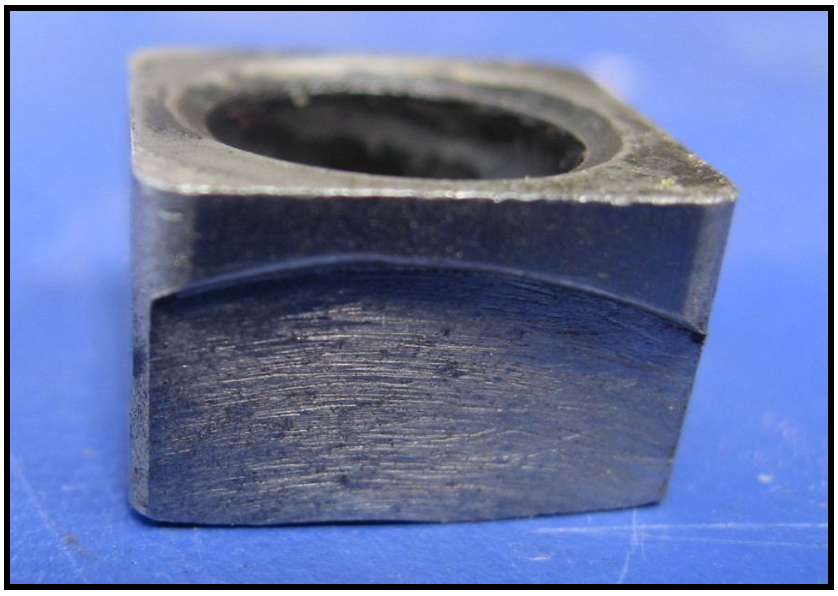
Ian Morrison

Improving the gearshift feel in an sw 20

Part 3

The two previous articles described how to improve the gearshift feel, first by replacing the rose joint connected to the gear-stick, and also by replacing the OEM rubber mounted bushes at the gearbox end.
After fitting those parts I thought this was about as good as it gets, but there was more to come.
I didn't think that the sideways slack in the gear-lever would matter that much, but after reading a post on the MR2 forum (A great resource for information and help) about the square block that moves the selector shaft in and out of the gearbox when the gear lever is moved from side to side, I decided to pull mine out and have a look.

I had wondered if this part was interchangeable between NA and turbo models, because it appears that brass blocks are used for some turbo gearboxes.
The block in my car appeared to be made of steel, but it must be of softer metal than the selector shaft, because that didn't seem to have worn much at all.

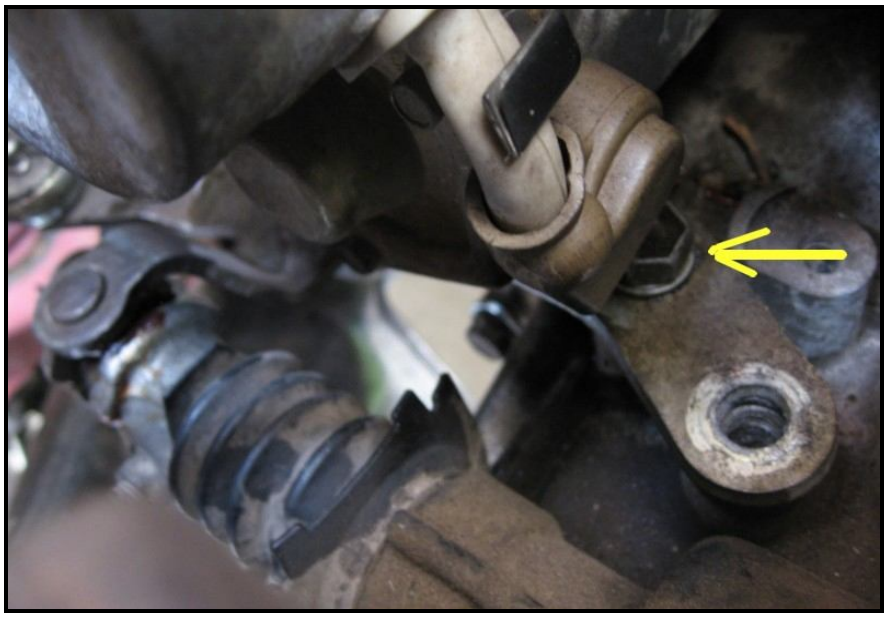


The picture shows the wear I found on the block (about ½ mm each side) that doesn't seem like much. But it all adds up, because as I've mentioned before, this slack is magnified at the gear knob.
In the next pic looking down into the engine bay you can see the selector shaft and the tip of the activating bell crank above it. Underneath is the block, which is hidden.

On my 90 model NA, I thought it would be easier to tackle this job working from the top of the engine bay, rather than from underneath the car.

Very important!! Before starting the job, I first disconnected the battery.
Then I removed the air intake and filter box.
I then removed the end bolt holding the bracket and bell crank assembly, together with the stay above it.
I then removed the starter cable and connecting wires, and loosened the 2 starter motor bolts (the hardest part, good hex sockets needed), no need to take the starter right out, but just enough to tilt it slightly to get a 14 mm ring spanner on to the bolt half hidden under the starter motor.
This bolt only needed to be undone a few turns to allow tilting the bell crank assembly enough to remove the block.

The next picture shows the bolt removed, and you can just see the other bolt half hidden under the starter motor.



The block was only worn on 2 sides so I simply rotated it 90 degrees, greased it and put it back, but on some cars the block may have already been rotated so it might be a good idea to get a new one from Toyota before tackling the job just in case.
Replacement blocks are also available from other vendors and a roller bearing replacement for this part is now available that could be the best option of all.

Eliminating the slack in the linkages covered in these three articles has absolutely been worth the effort and has really transformed my MR2.
Gear changing is now brilliant and much easier to select gears, especially when shifting across from second into third and vice versa.
It's surprising to think that before I started this project, I really didn't think my gearshift was all that bad.

And for anyone contemplating fitting a short shifter to their car, perhaps the mods described here should be looked at first.

Ian Morrison.

These articles were first published in the Victorian MR2 club Magazine, Track Record