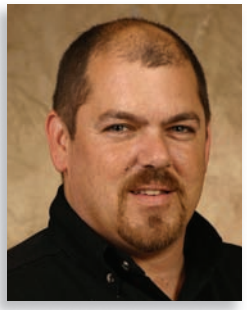
Slick Shifting Shaves Seconds Off Strip Times



by Larry Frash

When I was younger and had fewer financial commitments, I did a lot of drag racing. My own race car was a 74 Vega with the 140 cubic inch 4-cylinder. It had 11.00 to 1 pistons, big cam, large valves, four-barrel carburetor, port injected NOS, etc. I swear I had more money tied up in the engine than my dad did in his 327 small block. Four-cylinder racing can be expensive because most parts have to be custom made.

I ran two different transmissions over the four years I raced: One was a manually-shifted THM200 with a Chevette high stall converter. It ran 14.93 to 15.10 seconds through the quarter mile, depending on the weather.

The other transmission I ran was a Saginaw 4-speed with a scatter shield and a 30-pound, steel billet flywheel. I think it took about 4 seconds to get the RPM up to 6500, but once I let the clutch out, that car launched hard! The car still ran the same times, but it was much more fun speed shifting while keeping the NOS button on full blast.

For those of you who don't know what speed shifting is, it's when you keep the throttle on the floor and load the shifter toward the next gear. It won't come out of the gear you're in because there's too much load on the slider. As soon as you're ready to upshift, you simply depress the clutch just enough to release the load and you're in the next gear before you even release the clutch pedal. It usually barks the tires in second and sometimes even third gear. It's fun and fast!

You can speed shift virtually any standard transmission. Some are harder than others and most don't last nearly as long when you do. You usually get a little grind during the shift and we all know what's happening during that grinding sound. But there are some internal modifications you can do to make a standard transmission shift even smoother while speed shifting.

In this article we'll look at a little trick that, in the '60s and '70s, was called *slick shifting*. Before we get started though, we'll briefly cover how synchronizers work, because it's important in understanding how this modification improves the transmission's shifts. For a further, more in depth understanding, I suggest you read through an article by Steve Bodofsky in the May/June 2003 *GEARS*. This was a great article about how synchros function.

First let's briefly cover the parts involved in making the shift (figure 1).

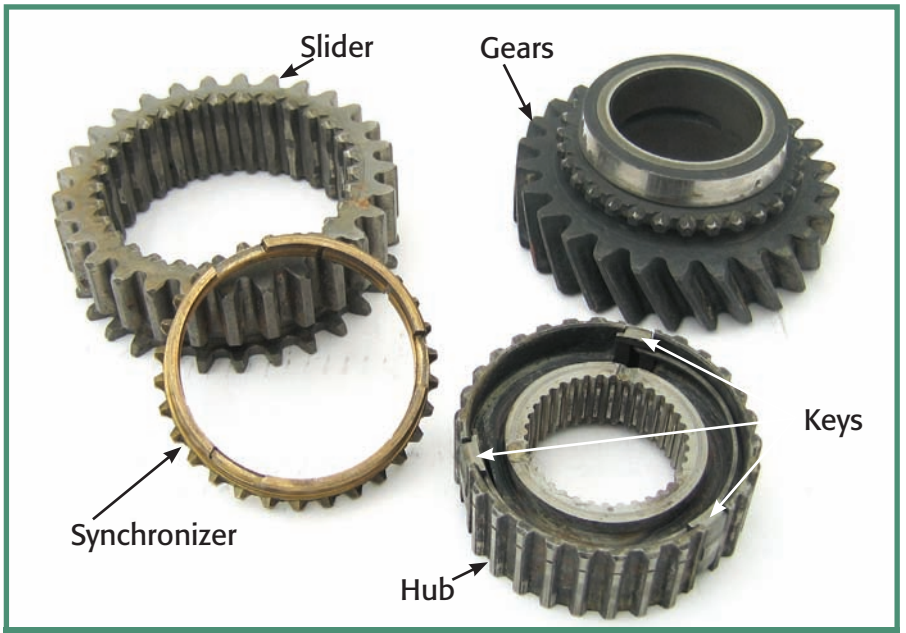


Figure 1

1. **Gear**
2. **Hub**
3. **Slider**
4. **Keys**
5. **Synchronizer**

As the slider is pushed toward the gear, the three keys push the synchronizer onto the cone shaped portion of the gear. Because the synchro has three notches that line up with the three keys, the synchro can't spin inside the hub. As the synchro is pushed toward the cone shaped portion of the gear, it acts as a brake to get the gear spinning at the same speed as the hub.

This is pretty simple to understand but what many people don't understand is what the teeth on the synchronizer ring really do. The notches in the synchro are wider than the keys, which allows the synchro teeth to rotate and partially block the teeth of the slider.

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So this is where slick shifting comes in: What you do is grind every other tooth off of the gears (figure 2) and every other tooth off of the slider (figure 3).

This prevents the slider from traveling past the synchro, and more importantly, into the engagement teeth of the gear.

Once the gear speed matches the speed of the slider and hub, the rotational load of the synchro relaxes and allows the slider to move past the synchro, into the teeth of the gear; this completes the shift.

What makes the shift really hard to complete is that the engagement teeth of the gear and the slider are designed very close to each other to keep backlash out of the transmission. This is for driver comfort so the vehicle doesn't clunk when you let off the accelerator. This tight tolerance makes it more unforgivable during the shift. In other words, the slider must be almost perfectly aligned with the gear or it will try to bounce back, causing a grind.

So this is where *slick shifting* comes in: What you do is grind every other tooth off of the gears (figure 2) and every other tooth off of the slider (figure 3). This makes it very easy for the slider to align itself with the gear during a shift. At high RPM speed shifting, this makes the shift easier and quicker. There's no reason to modify first gear because you don't upshift into first, and on hard launches you really want all the teeth to be there.

During assembly of the slider and hub, you must align each of the keys with an unground tooth of the slider (figure 4).

Grind every other tooth from the gear

Figure 2

Grind every other tooth from the slider

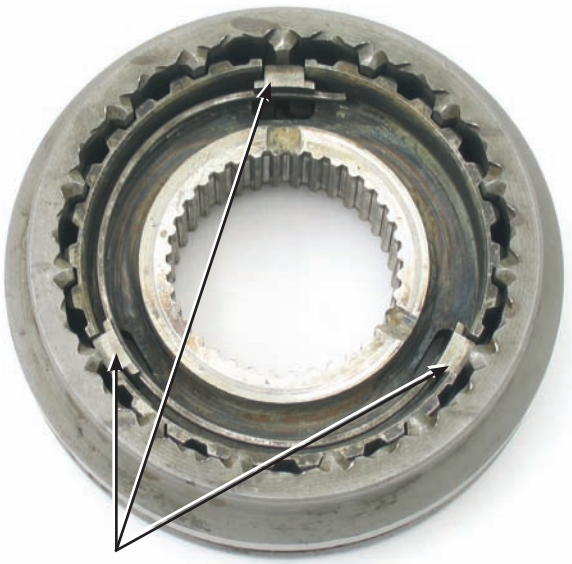
Figure 3

Which transmissions can you make this modification to? The only criteria are (1), there have to be an even number of teeth to start with, because you have to grind every other tooth off. And (2), because all keys must align with an unground slider tooth, the total number of teeth must also be divisible by the number of keys (usually three).

Now you're probably wondering what to do with the teeth on the synchro ring. Do you leave them on, cut every other tooth off, or cut them all off? We hinted at the answer during the explanation of what they do. Remember, they block the slider from passing the synchro, until the speed of the gear and slider match. So, if you leave them on, the shift will still be easier to complete and that's fine.

The speeds don't have to match completely, because of the extra clearance the teeth have now. But if you cut them all off, the shift occurs when the gear is still spinning faster than the slider, so you may get a very small grind which will accelerate wear. So for all-out racing or in a street rodder where you want a very quick shifting transmission and don't mind the accelerated wear of the gears and slider, cut them all off (figure 5). It makes for a much quicker shifting transmission when you do.

Keep in mind that this does weak-



All keys must line up with the remaining teeth from the slider

Figure 4

For *all out* high performance, cut all of the teeth off of the synchronizer

Figure 5

en the transmission slightly, and speed shifting even a stock transmission is very hard on it. The first time you speed shift a *slick shifted* transmission with no teeth on the synchros, you'll think you missed the gear, because you feel virtually nothing in the shifter during an upshift.

Before you start grinding the teeth, you must realize that the metal used in the gears and the slider is very hard. You must use grinding stones to remove the teeth, and this may take several hours to complete.

Well that's it: Have fun and go out and bang some gears!