

# HYBRID GEARING

*Why choose between a derailleur and internal gears when you can have both?*

*by Sheldon Brown*

There are basically two types of gear-shifting systems for bicycles. Derailleur gears, as most modern multi-speed bikes use, are the type that move the chain back and forth among different sprockets, and internal gears, which are built into either the rear hub or bottom bracket. I addressed this type of gearing in my last

“Mechanical Advantage” article.

But what about combining both of these systems on the same bike? This is often possible, and this type of setup is commonly called “hybrid gearing.”

Hybrid gearing is not for everybody, but it is beneficial for riders of less than normal strength, or with heavier than normal loads to transport. It also permits limited shifting while the bike is stopped, which is particularly useful for commuting in stop-and-go traffic.

Probably the most important modern application for hybrid gearing is for bikes (or trikes) with smaller drive wheels, such as folding bikes and many recumbents. For example, let’s consider a bike with 44-406 (20 x 1.75”) tires. The smallest readily available cassette sprocket has 11 teeth. The largest standard chainring with a triple crankset has 52 teeth. Assuming 170 mm cranks, that combination gives a gain ratio\* of 6.6.

This ratio is the same as 52/16 with 32-622 (700 x 32c) tires. Many cyclists would spin out in such a low gear, but if you combine the derailleur with an internal hub gear, for instance a SRAM 3 x 9, that same combination gives you a gain ratio of 9.0, which is a bit higher than a 53/12 with the larger wheels! Nobody in the world needs a higher gear than that.

To get a gear that high with a straight derailleur system, you’d need to replace the 52-tooth chainring with a 71-tooth. Chainrings this large are very scarce, and even if you find one, you will not find any front derailleur that will be happy shifting it over any useful range. If you managed to come up with a 9-tooth



*A Shimano Nexus seven-speed manual hub.*

sprocket, you’d need a 5-tooth ring to get the same top gear.

## Available Systems

SRAM (formerly Sachs) offered a “3 x 7” model for several years, and there are a lot of them on the road. These were three-speed internal hubs with a driver that would accept a Shimano type seven-speed cassette. The internal gear hub gave a high gear 136%, direct-drive middle gear, and a 73% low gear.

The current offering from SRAM is a completely redesigned 3 x 8 or 3 x 9 hub. Although the internal gear ratios are the same as those of the 3 x 7, the internal mechanism has been totally redesigned to facilitate underload shifting. The 3 x 8 and 3 x 9 systems use the same hub but with different cassettes and twist-grip shifters. They will work with any Shimano-type cassette.

Unfortunately, SRAM has not chosen to offer any choice of shifters; they only make a combined twist-grip shift unit to fit on straight 7/8” (22.2 mm) handlebars. The derailleur part of the sys-

tem may be shifted with any rear-derailleur control with the proper number of speeds, as long as a matching rear derailleur is used.

Shifting the internal hub with anything but the SRAM dedicated shifter is somewhat problematic. I have seen setups using Shimano STI shifters with the left shifter controlling the hub gear, but the cable travel is not quite right, and an overload spring had to be included in the cable run.

Shimano is due to release a similar system this fall, but details are not yet available. Although it is scheduled for rollout at the Interbike show in October, I wouldn’t expect actual units to be available for after-market retail sale before next spring.

Switzerland’s Schlumpf Mountain Drive and Speed Drive are two-speed bottom-bracket systems. The Mountain Drive provides direct drive with a reduction drive of 40%. If you have a 50-tooth chainring with a Mountain Drive, the reduction gear gives the equivalent of a 20-tooth “granny” chainring.

The Speed Drive provides direct drive with an overdrive of 65%, so your 50-tooth chainring offers the equivalent of an 82.5. The Speed Drive is particularly useful for small-wheel bikes for this reason.

The Schlumpf system is controlled by a button at each end of the bottom-bracket spindle. You shift it by pushing the appropriate button inward with your heel. The button on one side selects high gear; the button on the other side selects low gear. This system is compatible with all sorts of rear-drive systems.

## Front Derailleur Systems.

You can use a front derailleur and multiple chainwheels with any internal gear system, but to do so you also need to install a rear derailleur. This is because the rear derailleur’s spring-loaded cage is needed to take up the chain slack when you shift

to a smaller chainring. The rear derailleur would not require any control or cable; it would just be set in a fixed lateral position by the use of the high-gear limit stop.

It is possible to use a spring-loaded chain tensioner intended for singlespeed use, but these have only a very limited take-up capacity and will only work if the chainring size difference is very small.

## Historical Systems

Hybrid systems based on Sturmey-Archer hubs had a modest popularity back in the ‘50s and ‘60s. Cyclo used to make adaptor clusters that would allow the use of two or three sprockets on such a hub. I had one of these on my Elswick Tour Anglais. The four-speed Sturmey-Archer hub with three sprockets gave me a 12-speed bike in 1961, a time when 10-speed bikes were the latest exotic thing.

The Cyclo conversion kits are no longer available, but if you have an old three-speed and enjoy tinkering, you can actually do a two-speed derailleur setup with available parts.

Sturmey-Archer hubs have a couple of spacer washers next to the sprocket. If you remove the spacer washers, you can put on two sprockets back to back. It is also not difficult to modify Shimano Cassette sprockets to fit on a Sturmey-Archer hub—it’s just a matter of grinding six of the nine internal splines and rounding off the corners of the remaining ones.

For more information go to: [sheldonbrown.com/gears](http://sheldonbrown.com/gears) and [sheldonbrown.org/otb.html](http://sheldonbrown.org/otb.html). **AC**

*Sheldon Brown addresses many bicycle issues at [www.sheldonbrown.com/barris](http://www.sheldonbrown.com/barris)*