

Crank and Chainrings for Touring

What you need and how to get it

By Sheldon Brown

You might think that the length of the cranks should be proportional to the length of the rider's legs, but it doesn't usually work out this way in practice. It is common, for example, for mountain bikers to extol the use of longer cranks on the grounds that they supposedly give more "leverage" for better climbing.

Mechanical Advantage, September/October 1999), and by selecting the appropriate-sized chainring and rear sprocket, you can get any desired "leverage" with any length cranks.

Most riders do fine with something in the range of 165-175 mm cranks, whatever their leg length (though short riders should probably avoid 175s). Touring cyclists in particular should avoid excessively long cranks, because they force you to bend your knees farther than may be good for them.

Full Size vs Compact

Traditionally, cranksets for road use have had a large chainring with 50-52 teeth. Older mountain bikes used a 46- or 48-tooth large chainring. These would normally be used with a 13- or 14-tooth smallest rear sprocket.

In the early 90s, there was a move toward "compact" drive trains, where both front and rear sprocket sizes were decreased. For mountain bikes, 42- or 44-tooth big rings became the norm, along with 11-tooth sprockets.

Compact drivetrains improved clearance for mountain bikers when hopping over logs and boulders, and allowed a slightly wider gear range for the same tooth-size difference, and saved a bit of weight. They also offered a slight improvement in shifting. Unfortunately, compact drivetrains

are much more stressful on chains and sprockets, so everything tends to wear out considerably faster.

Compact drive is now pretty much universal on mountain bikes, but never caught on with road bikes. (Shimano made a compact RSX road group with 46 tooth big rings for a couple of years, but nobody liked the small chainrings.)

Bolt Circle Diameters (BCD)

Most cranksets used for touring have a five-arm "spider" that the chainrings attach to. Interchangeability of chainrings and cranks requires that you match the same hole pattern for the bolts that hold the chainrings to the crank spider.

These patterns are generally referred to by the diameter of an imaginary circle that would run through the centers of all of the chainring bolts. It is difficult to measure this diameter exactly, since there are no two bolts exactly opposite one another. The usual way to determine the BCD is to measure the distance between centers of two adjacent bolts and multiply by 1.7. (The BCD imposes a lower limit on chainring size, because if you make a chainring that is too small for the BCD, the chain will bump into the bolts.)

Here are some commonly seen BCDs. Bear in mind that this is not a comprehensive listing, as some specialty manufacturers, most notably TA of France, make other sizes:

110/74 This is the most widespread triple chainwheel setup, using the 110 mm BCD for the two largest rings, and a separate set of bolts on the 74 mm BCD for the small ring. Most touring and mountain triples of the 1980s and early 90s used this pattern, and there is a wider choice of chain-



PHOTO BY GREG SIPLE

The "ubiquitous" 52/42/30 triple comes on many new bikes — and won't give you an adequate low gear for loaded touring. You'll need to change that 30-tooth chainring for a 28-, 26-, or even 24-tooth ring. If you go with a 24, it's a good idea to install an anti-derailment device such as the Third Eye Chain Watcher (see sidebar on next page), shown above attached to the downtube.

This is a gross oversimplification. It is only true if you're comparing two bikes with identical wheel sizes, and the same sized front and rear sprockets.

In fact, "leverage" is just another word for gain ratio (see

rings available for it than for any other. 110 mm middle and outer chainrings are available in all sizes from 34 up to 54 teeth and larger. 74 mm rings come in even sizes 24-32 teeth.

130/74 This is what is now commonly known as a "road triple." The 130 mm BCD is also used on most road doubles, with the 74 mm granny. All current Shimano "road" triples use this BCD. 130 mm chainrings can't be any smaller than 38 teeth, but all sizes are available up to 54 and larger.

135/74 This is the Campagnolo equivalent. It uses standard 74 mm granny rings, but the outer two rings use Campagnolo's proprietary 135 mm bolt circle. Chainring sizes for the 135 mm bolt circle are limited to: 39, 42, 50, 52 and 53 tooth sizes.

94/58 This is the common "compact" 5-bolt triple used on many 1990s mountain bikes. Most 94/58 cranksets come with 44-32-22 or 42-32-22 chainrings. It is hard to find anything larger than a 46, so for road use you really will want a cassette with an 11 to get an adequate high gear. If you need a super-low gear, however, this is the ticket, because chainrings as small as 20 teeth are available for the 58 mm BCD. 94 mm chainrings are available in 30, 32, 34, 36 middle; 42, 44, 46 outer. 58 mm chainrings are available in 20, 22, & 24 teeth

110/74/58 TA of France makes a rare and expensive "Alizé" crankset that uses the 110 size for the outer two rings, but has two sets of bolt holes for the granny ring, one set at 74 mm, the other at 58 mm (you can't use both at once.)

Many newer mountain bikes use 4-bolt crank/chainwheel sets that are beyond the scope of this article. They generally have

Anti-Derailment Devices

In some cases, wide-range triple chainwheel setups may have a problem with shifting down to the smallest chainwheel. Adjustment of the low-gear limit stop may be excessively finicky — a bit too tight and the chain won't shift; a bit looser and the chain may shift past the small chainwheel and fall onto the bottom bracket.

A chain deflector attached to the seat tube can make this sort of overshifting impossible, and thus allow you to adjust the low-gear limit stop looser for a more positive downshift. There are a couple of models of these commercially available — the "Third Eye Chain Watcher" and the "N-Gear Jump Stop." These typically cost about 12 dollars, and should be available in any good bike shop.

similar availability to that of the 94/58 5-bolt systems.

Ramps, Pins and Gates

Older chainrings were very simple in design, and every tooth on a ring was the same as every other tooth. Modern chainrings, however, are computer-designed, and have special features to improve upshifting. These features include steel pins in the sides of the rings, machined ramps on the sides of rings and cut-down teeth at certain parts of the ring. These features are principally responsible for the drastic improvement in front shifting that occurred over the course of the 1990s.

There is, however a downside to this: since chainrings are now designed to work together in "sets," so if you want to customize your gearing and use "mismatched" chainrings, you risk a reduction in shifting performance. If your bike has indexed front shifting, as with Shimano's STI brake/shift levers, or most straight-handlebar shift levers, mismatching chainrings can lead to poor shifting, or may make some combinations unusable. Experimentation is sometimes required to determine the range of a given shifter.

Granny Replacement

So, what are you to do if you have a new bike with the now-ubiquitous 52/42/30 setup?

Where did Shimano and Campagnolo come up with that combination anyway? 52/42 is an old standard road double, and the manufacturers chose to "triplize" it by adding a 30 ... but why a 30? Unless you have something huge in back this doesn't give a low

gear adequate for loaded touring for most people.

The problem is that the manufacturers have to figure that a certain percentage of their bikes will be sold to clueless newbies who don't understand the proper use of a granny chainring.

Knowledgeable cyclists such as Adventure Cyclist readers understand that the granny ring is only for serious climbing, and is only to be used with the larger rear sprockets, but the manufacturers have to worry about the lowest common denominator, and are concerned about possible consumer complaints if they put a real granny ring on a road crank.

While the 42 and 52 rings have helper pins and ramps on their sides, there's nothing special about the silly 30, For loaded



PHOTO BY GREG SIPLE

Ramps on the sides of rings and cut-down teeth at certain parts of the ring, shown here, are two more ways designers have improved the shifting performance of chainrings, perhaps at the risk of making them look a bit bizarre. Chainrings are now designed to work in sets, so if you want to customize your gearing, don't use mismatched rings.

touring, most cyclists will want to ditch the 30 for 28, 26 or even a 24 in order to have a gear low enough to climb with the extra weight of their equipment. All of the systems that come with "road triples" work just fine with 28 or 26 tooth granny sprockets. To use a 24, it is often helpful to install an anti-derailment device such as a "Jump Stop" or "Chain Watcher." ●

Sheldon Brown has his own website, loaded with cycling info, together with Harris Cyclery in West Newton, Massachusetts, at sheldonbrown.com/harris



PHOTOS BY MARK GORSETH

Modern chainrings incorporate a variety of computer-designed features to improve upshifting, including steel pins in the rings, as shown here. These modifications are principally responsible for the drastic improvement in front shifting that occurred during the 1990s.