JUNIOR GEARS:

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This is a fairly comprehensive overview of gear restrictions for juniors in road and track events. This review is generally intended for racers or parents of racers, but should provide a useful review for officials too.

By general rule 1J6, juniors participating in road (road races, criteriums and time trials) are limited to a chaingear ratio of 7.93 meters (26′ 0″). This means that with the chain in the bikes tallest gears (biggest front ring and smallest possible rear cog), the bike cannot travel more than 26.0 ft with a single turn of the cranks. To verify compliance, the bicycle is put into the largest gearing, the (generally) left crank set pointing straight down at the beginning line, and then rolled backwards in a straight line. Traveling backwards will turn the crank, when the crank makes a single complete revolution and again points directly down, it cannot have traveled past the end line, which is 26.0 ft away from the beginning line. This process is called the rollout method.

The maximum actual gearing depends on wheel and tire sizes. Most road bikes will be equipped with 700c wheels and 23c tires and for this, several combinations of front/rear gears should work. According to page 136 of the 2006 rulebook, the following gear combinations and the expected rollout lengths are:

- 53/15 for an expected rollout of 24′ 6″;
- 52/14 for an expected rollout of 25′ 9″;
- 48/13 for an expected rollout of 25′ 7″ and
- 45/12 for an expected rollout of 26′ 0″.

A 53/14 has an expected rollout of 26′ 3″, which is 3″ too much. I have seen some juniors using this gearing pass rollout – the 3 inches isn't very much and is often missed. However, it isn't supposed to work and I've seen too many juniors disqualified (or given time penalties) for this seemingly small but distinct infraction. And although the rulebook specifically calls out the acceptable use of 45/12 and 52/14 combinations, it further states that performing a rollout remains the only method for verifying compliance. Using smaller (20c) tires may allow a 53/14 to work and the use of larger (25c) tires will likely prevent the use of 45/12 gearing (note: intended more for the rollout official than the racer but if you are testing a 45/12 setup, all the slack needs to be taken up before performing the rollout so that the crank starts turning instantly when the wheel starts turning).

So, how to comply? Replacement of the stock 53T front chain ring with either a 45T or a 52T chain ring will be necessary. Depending on the choice for the front chain ring, replacement of the rear cassette or blocking out of some of the smaller rear gears may be necessary. For 9-speed Shimano, the 45T and 52T rings are fairly plentiful (look on eBay or at bike swaps) and are reasonably priced. However, for 10-speed Dura-Ace, 52T chainrings having the stock Dura-Ace look, they are at least $120!

BLOCKING OUT GEARS: If your choice is to go with a 52T front chain ring, you will need to block out cogs smaller than the 14T cog. As it is likely that your two smallest cogs have 12 and 13 teeth, respectively, this means you need to block out 2 gears. There are several ways to block out gears and with a little practice you should be able to do this in less

than 2 minutes. To begin, make sure the drive train is clean, freshly oiled, and shifting properly. Put the chain onto the appropriate rear cog (see above) so that your expected rollout will be met. Figure 1 shows a bike with a 52T front ring and a 12-25 rear cassette with the chain on the 14T rear cog. Also shown in this figure are 3 adjusting screws. The upper screw is called the B-screw and it generally does not require adjusting; leave this one for your favorite mechanic to play with. The lowest one adjusts the possible range of the derailleur when it is on the largest rear cogs. Again, stay away from this one as turning it the wrong way can lead to the spokes playing expensive games with the derailleur.

The third screw is the high range adjuster. Turning it in (clockwise) will limit the range of the derailleur and hence, tend to prevent the chain from engaging smaller gears. Turning it out (CCW) allows more range and will therefore allow engagement of smaller gears. To make the adjustment, start screwing the high range adjuster in (CW) until you just feel it start to tighten up. From this point, you'll probably want to turn it another ½ turn. Now, downshift the gear lever so that it would normally allow engagement of the 13T cog and turn the crank. If it drops down to the 13T, you haven't turned it in far enough. Make your adjustments in ½ turn increments until you just keep it in the 14T. Turn it too far and you'll notice that the chain either jumps into the 15T or tend to skip upwards towards it. If this happens, turn the screw back out a little.

One limitation is the length of the range adjustment screw. The screw is usually long enough to allow blocking out of 2 gears (as shown in Figure 1). However, I have found bikes where the limit screw isn't long enough to block out even 2 gears (particularly with Campy Record), you'll need to check your own bike here. Moreover, if the smallest gear on the rear cassette is an 11T cog, the screw probably won't be long enough to block out 3 gears. The same might be true if you're running a 53T front ring and you need to block out a 12-25 cassette to the 15T cog – I saw this with 2 bikes at the 2006 Swiss Criterium in Glendale, AZ.

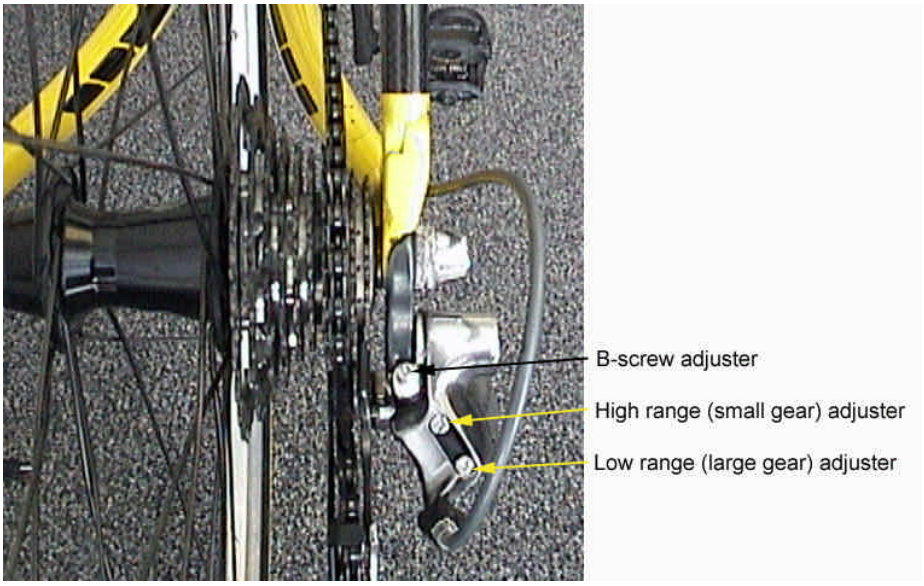

Figure 1: Adjustment screws on a Shimano rear derailleur

Figure 2: Adjusting the high range adjuster screw

Having one or more gears blocked out will have one side effect. Although the derailleur will not allow the chain to engage the blocked out gears, the shifter will still "click" to those gears. As this is done, the cable will appear to have extra slack in it. This is normal and the cable should not be adjusted to remove the slack from the cable. For at least Shimano shifters, the amount of cable taken out by each shifting click is not the same for all gears and hence, if the cable is adjusted, the indexing of the derailleur will be wrong resulting in imprecise shifting.

For national championships events, blocking out rear gears is not allowed. This means that it will be necessary to run either a 45/12 or a 52/14 (with a special 14-25 junior cassette). Both methods work well but depending on which system you use, be careful of getting spare wheels after a flat during a race (for example, if you run a setup having a 52/14 combination and get a replacement rear wheel with a 12T rear cassette on your bike, you won't make roll-out and will be disqualified).

For most local races, rollout is done before the race. This is because at most venues, the juniors race first and so, the officials have time to do the rollout before the race. Following the race, the officials are busy getting the next event going. For larger events or for state championships, rollout is done after the race, even if there was an unofficial (prerace) rollout. Remember, although rollout may be done before a race, it is the after-race rollout that counts. **As of 2007, juniors must use their junior gears even if riding in elite (i.e. senior) races**!

WHEEL COMPATIBILITY: For juniors having Shimano 10-speed setups and who are running FH/WH-7800 10-speed Dura-Ace freehubs, Dura-Ace 14-* junior cassettes are not yet available and Ultegra junior cassettes (13-25 through 16-27) will not fit onto the hub. You'll need to either use a 45T front ring with a 12-* Dura-Ace cassette or use a 52T front ring and get a spare wheel that will accept an Ultregra junior cassette. For the junior rider who wants the flexibility to run larger gearing, the latter may be the best choice as you can change out the rear wheel and be running an 11-tooth rear cassette (i.e., a 52/12 or 52/11)

without any other modifications. (note: Mavic makes a rear cogset that is compatible – use the Kit No. 4).

USE OF A 45T FRONT CHAINRING AND A STOCK (12-*) CASSETTE: In the expected rollout, notice that a 45T front chainring paired with a 12T rear cog provides the maximum allowed rollout of 26′ 0″ (with 23c tires). For juniors, this is an ideal setup as most bikes come standard with a 12-* rear cassette so the only expense is a 45T front chainring. These (3/32", 130mm BCD) chainrings are available on eBay for under $50., including shipping.

PROBLEMS I'VE OBSERVED:

In carefully watching rollouts over the past couple of year, I've noticed a couple of problems that can confuse racers and officials alike.

1) The bike needs to be tested in its tallest configuration. This means taking a quick look at the rear cassette and verifying that the gearing is in order – smallest on the outside to largest on the inside. Then downshifting the derailleur mechanism and turning the cranks to make sure that the chain is dropped down in the smallest possible rear cog.
2) As long as you're taking a visual survey of the rear cassette, take a look at the number of teeth on the front chainring – it is generally stamped on it. If you see a 53T chainring and the chain on a 14T cog in the rear, you should test the rollout very carefully – don't be surprised if it comes up too long.
3) Do not assume that the junior has handed you the bike in its tallest configuration. Verify it!
4) As mentioned immediately above, it is possible that some slack is in the freewheel so that when you start rolling the bike backwards, the cranks don't start rotating right away. You should make sure that the slack is completely out of the system or else 45-12 setups will not pass.
5) Have the rollout done to a sharp line, not a 2-inch wide piece of tape on the ground. As a 53-14 setup should fail by only 3 inches, using a 2-inch wide piece of tape allows for 4 inches of interpretation (yes, you can use the leading or trailing edge, but why not draw a line on the tape?).
6) Measure and mark the 26 feet rollout length accurately. At one major race in 2006, I measured the marks and found that they were about 25′ 10″.