

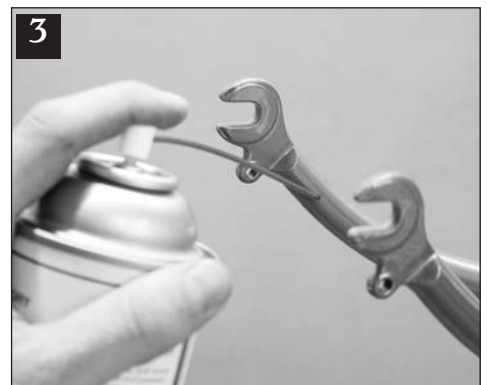
One Way To Assemble a Bike



A STEP-BY-TEDIOUS-STEP GUIDE TO HOW WE DO IT. THE MECHANIC IN THESE PHOTOS IS ANDREW. HE EVEN WROTE THE CAPTIONS. HE DON'T WORK HERE ANY MORE, BUT HE'S STILL A PAL AND THIS IS STILL OUR METHOD. THESE DAYS, ROBERT KUROSAWA (PINEAPPLE BOB) ASSEMBLES THE BIKES HERE, AND HE'S GOOD, TOO. THE PROCEDURE SHOWN ISN'T THE ONLY ONE THAT WORKS, BUT IT'S HOW WE DO IT HERE, AND IT DOES WORK.



Above: The frame as we receive it. The headset is installed, but may need adjusting and more grease.



We Boeshield all the frames thoroughly, turning them this way and that to make sure the rustproofing gets into all the corners.

Frames get a full set of water bottle bolts, often greased and installed, but at least included. The bottle cages attach with M5 stainless steel socket head cap screws, which take a 4mm allen. These weigh fractionally more than the lightest bottle cage bolts—probably button-head bolts that take 3mm allens—but we like 4mm allens, because the wrenches are harder to lose, and 4mm has a non-metric equivalent (5/32"), in case you're in a pickle somewhere where they don't have metric wrenches.

Our seat binder bolt (not shown) is an ordinary M6x20mm bolt that you can replace at many hardware stores. Every frame we make uses the same binder bolt, and it is a smart choice.





Here's what I get from the warehouse—a bin full of parts, which in 2.5 to 3 hours will become a bicycle. With cantilever brakes and bar-end shifters, it would take up to 4 hours. A less efficient builder might take up to 6 hours.



Production wheels get trued a little, but custom wheels don't, because they're already finely tuned and perfect. All the wheels get cotton Velox rim tape, and talc on the tubes, to prevent sticking.



A Phil Wood retaining ring. I put it in a turn or so, then spread the included Loctite over the remaining threads. The one with the red mark has a left-hand thread, and goes in the drive side. Sometimes it takes a little fiddling to get the chainline and clearances right. I Loctite until I've got it figured out.



I lube the mating surfaces on the Phil bottom brackets—the grease makes removal much easier. I've don't grease the frame threads, though—it'll render the

Loctite ineffective. To remove a stuck retaining ring from a Phil BB, thread it back into the frame, with the spindle on the outside. You can use the BB as a lever, and wiggle it right out of the ring.



Both rings tighten in the same direction, and it's a lot easier when you have two tools—one to hold one ring, one to tighten the other ring.



Time to mount the cranks. Look for about a 5mm gap between the inner ring and chainstay before tightening the crank bolt. When you use the same maker's crank and recommended BB, it'll work out fine. When you mix brands (as is always the case with Phil), you may have to shift the BB spindle left or right some.



I grease the crank bolt threads and torque the bolts to 25 ft-lbs. Make sure the gap between the chainring and the chainstay is still at least 2.5mm. With certain combinations (T.A. Cyclotourist cranks come to mind here), tight clearances down there are almost a requirement—I've seen a gap as small as 1mm. It may work, but why push it?



The front derailleur: The cage should be parallel to the chainrings. I make the gap between the big ring and the cage as narrow as I can, given the restrictions a low bottom bracket combined with small chainrings can put on my choice of front derailleurs. We can't use a 105 triple on a Rivendell with 700c wheels and a 46T big ring—the cage hangs down too far and hits the chainstay. We use double derailleurs on 46-36-24 combos, though, and they work fine.



Grease the rear derailleur bolt and put it in, making sure the B adjustment screw is clearing the tab on the dropout hanger. BTW, the length of the hanger and your shifting (index or friction) help determine the real capacity of your derailleur. We use derailleurs rated to 27T on 28T freewheels, and they'll probably even handle a 30T cog, depending on the dropout.



14
Brakes: Just make sure you use the proper washers (or none) to ensure sufficient engagement of the threads. Notice that the pads on these Ultegra standard reach dual-pivots have been swapped out for Mathausers.



15
The brake is centered when this mark (arrow) is centered. There's a fine adjustment, which we'll get to later. For now, center the caliper and tighten it.



16
Stem into quill: I grease it up good, getting grease on the threads of the expander bolt and all over the wedge, even between the wedge and the quill. Grease, lanolin, or Phil oil work fine. Oil the expander bolt threads if you're fanatical. It cannot hurt.



17
The Nitto Stem Pry: Japan's gift to bicycle mechanics, especially those who have ever had to install a Nitto handlebar shim. Even if I'm not installing a shim, this tool is a joy to use. The handlebars go right in, no scratching or swearing.



18
Since I only work with new brake levers with fresh and flexy hoods here at Rivendell, I'm comfortable turning them inside out like this for installation. Older gum hoods easily tear, so don't do this with them.



19
Where do the levers go? It's up to you. I like to position it 1-1.5cm above the bottom of the bar, as shown. The "traditional" position is level, but higher supports your hand better. Then, rotate the bars up so the ends point toward the rear brakes. On most bikes, that's about 10 degrees from horizontal. Look at the beautiful curve on this bar.



20
Anywhere there's the potential for metal-to-metal contact, I prevent corrosion and frustration by greasing one surface before assembly. I also put beeswax on the screws, both to prevent corrosion and to keep them from loosening. Sometimes the square hole in the washer here is tight on the boss. File it or tap it on, using a socket (or dumbbell) and light mallet.

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21
Here's the mounted shifter. This one's an old Superbe Pro. On our new Silver shifters, grease the little silver washer, both sides.



22
Grease the threads when installing a freewheel or cassette! Or use anti-seize. It isn't as big a deal for cassette lockrings, because they aren't tightened by pedaling force, but it's still a good idea. For freewheels, just thread them on by hand and use the test ride to tighten them. Cassette lockrings get torqued to 30ft-lbs.

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23

Install the wheels and align the brake pads to the rim. Make sure the entire contact surface is 1mm or so below the upper edge of the rim, so the pads don't meet the tire after they're worn down thin (later on).



24

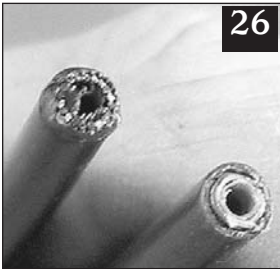
Install the dual-pivot caliper with the wheel centered between the pads as much as possible, then use a 3mm allen to fine-tune it. Turn clockwise or c-cw, as the brake requires. Single pivot brakes require a different procedure, not shown.



25

Chain length: I leave the chain as long as I can, still making sure the rear derailleur takes up the slack when the chain's on the small cog and the small ring. If you have a triple with a relatively small inner ring and a relatively large outer, setting the chain length this way may result in your

derailleur being ripped violently from its hanger (or worse) when you're in the big ring and you try to shift into the big cog. If you want to ride the big ring x big cog combo, make sure the chain is long enough to do that. For more on chain length, read RR 25. (Or go by this: The chain should be just long enough to be tensioned in the small x small combination, and long enough to shift easily to the big x big.)



26

Two kinds of cable housing: shifter housing (L) and brake housing (R). You can use brake housing for shifting, though it'll compress

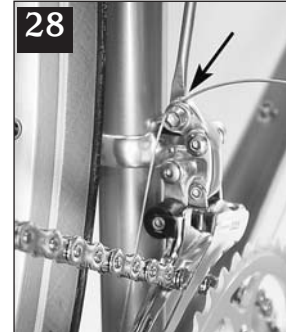
a bit and screw up your indexing. You CAN'T use shifter housing for brakes, because the strands are parallel, not wound in a spiral. So the housing lacks the compression strength that brake cable housing needs.

Cut the ends as square as you can, and file or grind them until they're free of burs. If you file: Keep the file stationary, and move the housing!



27

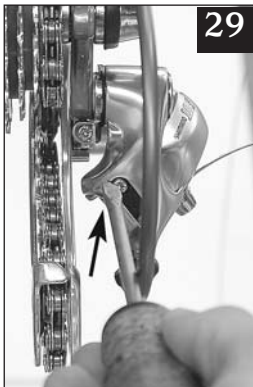
Attaching the front derailleur cable - using a ball-end allen wrench makes this easier, but I don't tighten it all the way down with one—it could slip and damage the screw. You'll probably have to readjust the cable anyway after setting the limit screws.



28

The limit adjusting screws are on top; see the arrows. Turn them 'til the chain drops easily but not overenthusiastically onto the inner ring while on the big rear cog, and

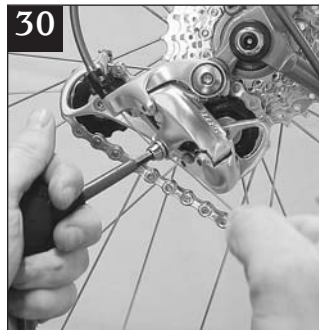
climbs without a struggle up onto the big ring while on the small rear cog. Make sure the cage does not come into contact with the crank! Sometimes you have to bend the cage some, if you have an odd derailleur-crank combo.



29

Despite this photo, I usually adjust the rear derailleur limits before putting the chain on. I can easily see when the upper (jockey) pulley is aligned with the biggest and smallest cogs, and that's all there is to it. 99.9% of the

time, you can safely ignore the B adjustment screw - some derailleurs don't even have one.



30

I screw the barrel adjuster in all the way, and hold the derailleur in its farthest-out position while tightening the cable.

There are all kinds of tricks for making supposedly non-compatible parts index together, like putting the cable on the wrong side of the bolt to change the travel, but I don't know any of them.



31

Brake cables: Grease the head of the cable to prevent squeaks. Lube cables with Phil oil, grease,

or graphite. The arrow points out that I adjust the brake with the barrel adjuster UP. This is technically wrong, but makes it easier to remove the fattish 700x35 tire (open the brakes up by screwing the barrel down). Also, I adjust the cable with the quick-release UP, also wrong, but since I'm not tensioning the cable, there's slack in it, and after I tighten the pinch bolt (as shown), I flip the quick-release lever back down, and it takes up the small amount of slack.



32 Once you've test-ridden the bike and gotten everything in the right place, it's time to wrap the bars. Cut two two-inch pieces from the end of each roll (don't cut all four from one roll, or you'll be short), and cover the brake lever clamps with them.



33 I wrap toward the outside of the bar, over the top. On the right side of the bar, that's clockwise when viewed from behind. I don't do the figure-eight thing around the brake lever, because with our wide bars, one wrap around the lever covers it. I use my fingers to hold the tape down, and pull hard on the tape in the direction I'm going. With cloth tape, I wrap the left bar counter-clockwise, and the right bar clockwise.



34 If the tape is bunching up and getting wrinkled, pull it tight, wiggle it side-to-side, and if it still wrinkles, push the wrinkle out. It takes practice. I've done this about 120 times. Some tape colors are easier to wrap than others, for some reason.



35 Twine: I cut a piece 9 feet long, then fold that in half, and cut an eight-inch piece from the center, leaving me with three pieces. One long piece gets wrapped around the end of the bar tape, starting from the inside. Wrap it nice and tight, pushing the strands toward each other, if you have to, with a screwdriver or something.

36 When you have enough twine left for about five more wraps, make a loop with the short piece, and wrap over it (with the loop toward the outside).



37 Keep wrapping the twine over the loop, and push the end through it. Grab the ends of the looped piece, and yank them back through, tightening the loop around the tail end and pulling it through. Coat the twine with something that dries clear, and is waterproof yet toxic; then shellac the bar tape if you like. That's it.



38 Here's the finished bike. About two weeks later we got a note from its new owner: "My new Rambouillet came about a week ago, and I've been so busy enjoying it that I plum forgot to contact you folks and say THANK YOU!! It's the finest riding, best fitting, prettiest bicycle I've ever owned. You people do it right. Keep up the good work!"



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There Are Lots of Ways To Assemble A Bike

The assembly process shown here is one of many possibilities. What's important, if you assemble bikes for a living or simply do it a lot, is that you get a routine down that you can follow from bike to bike. It's more efficient that way, and you're less likely to forget something.

For space reasons we've not shown things like making sure the wheels are true, and that there's enough grease, and alignment checks, and so on. I/Grant am confident there isn't a bike shop in the land that assembles a bike *better* than we do, but I'm equally sure there may be shops within phone range of you who are just as good, even if they don't twine the bars.

Some shops tout themselves as the only good assembly in town, and say everybody else is a hack. It's fine to be prideful, but top-quality assembly is something lotsa folks can do.

How can you tell who's good? Most complete bikes come to a dealer 90 percent assembled, and if that's all they work on, it's likely that some of the skills required to build from scratch are a bit rusty. But if a shop does a fair amount of business in framesets, it's likely they have experience assembling them from scratch. Also, if you're getting a road bike assembled, make sure your shop has experience in road bikes.

Andrew's Additional Assembly Notes

Not every bike we build has parts this fancy—we have less costly cranks and bottom brackets, too, and seeing this build shouldn't deter you from putting those on your Rivendell, Atlantis, or Rambouillet. Every bike part we offer meets our high standards.

Most of the bikes I build have cantilevers. The best way to set up cantilevers for lots of leverage and stopping power: Keep the straddle wires low and grip the pad studs toward the outer end. This increases mechanical advantage. It should be an article itself, and will be, but not right now.

Most of our bikes have bar-end shifters. The bikes with cassette hubs get set up to index, even though I like to think most people use the friction option.

This bike has the unusual and not generally recommended combination of light-action, dual-pivot brake calipers and non-aero brake levers. Brake levers intended for use with these calipers have springs that compensate for the light action and pull the cable back through the sometimes convoluted housing inherent with aero routing. Non-aero levers don't have these springs, so sometimes the brake doesn't snap back after you release the lever. This time it worked fine. If you want to use this combo, you may have to take the springs out of the calipers and bend them a bit to increase resistance. Not a do-it-yourselfer? Don't do it!

Assembling a bike with used and mismatched parts presents unpredictable challenges that can add hours or days to the job. If you want to do it, great, but here, we use only new parts we know work together perfectly. Your bike can still be unique, though.

In a perfect world, all of our customers would pickup their bikes and ride away. That happens only about 2% of the time, though, so we pack most bikes—another 45 minutes, if you're good and have it down. I cover all of the frame tubes in bubble wrap, and anchor the right crank to the chainstay. Then I remove the handlebars and front wheel, and attach them to the frame (with plenty of padding between them and the frame), tying down anything that might move around and do some damage. I stick a dense blue foam block into one end of the box, and poke the fork ends into it. Then a smaller box, containing the saddle, seat post, pedals, front skewer, etc. gets taped inside the big box, a plug goes into the seat lug to protect the fancy point, and another foam block goes on top of that. If the frame is 64cm or smaller, I'm done. If it's a little bigger, I may need to make a peaked roof to accommodate the larger frame. If it's a 68cm, I remove both wheels, the right crank, the rear derailleur to fit it into a box UPS will accept.

Tool List

(* means nice to have, but its function is duplicated by other tools in the list)

1. 4-5-6mm allen Y-wrench
2. 8-9-10mm socket Y-wrench
3. separate allens, 3-4-5-6-8mm
4. separate box & open-end wrenches 8-9-10mm
5. 12-inch crescent wrench (opens to 32mm +)*
6. crank bolt extractor (or use self-extracting bolts)
7. crank extractor (or use self-extracting bolts)
8. side cutters (dykes)
9. cable and indexed housing cutters
10. chain tool. ProGold is unbeatable.
11. separate T-handled allens 4-5-6*
12. mini vise grip
13. headset wrench (thin spanner), 32mm if 1-inch headset
14. headset locknut wrench, pro style
15. headset cone slammer
16. headset press (or do it yourself; see RR27)
17. headset extractor (or long punch, screwdriver, hammer)
18. tub of grease with small hole in the top, with brush in hole. Lanolin is useful, too, for external metal-to-metal contacts.
19. flat or half-round file, fine
20. dirty clothes or an apron
21. rags or shop-quality blue towels (good hardware stores have them)
22. bike stand. Tip: Hold the bike in the stand by the seat post, not the seat tube. Tilt the bike slightly downward, so the bars don't swing around and smack the top tube. (Some small-cheap-light-portable bike supports will do the job, too.)