ZINN & THE ART OF
ROAD BIKE
MAINTENANCE
The World's Best-Selling Bicycle Repair and Maintenance Guide

FOR ALL
ROAD +
CYCLOCROSS
BICYCLES

Carbon frames
CHAPTER 17

11-speed cassettes
CHAPTER 8

Electronic shifting
CHAPTER 9

Carbon wheels
CHAPTER 13

Press Fit
CHAPTER 11

Integrated headsets
CHAPTER 12

Integrated shifters
CHAPTER 6

Through-axle forks
CHAPTER 16

Hydraulic disc brakes
CHAPTER 10

Tubeless tires
CHAPTER 1

LENNARD ZINN
PRAISE FOR

ZINN & THE ART OF ROAD BIKE MAINTENANCE

“Zinn & the Art of Road Bike Maintenance can help you remedy any problem that might arise while working on a road bike. It’s packed with in-depth explanations and useful diagrams.”
—VeloNews magazine

“Zinn & the Art of Road Bike Maintenance is the gold standard textbook for aspiring home mechanics. From simple tasks such as fixing a flat tire to advanced overhauls of drivetrains or brakes, this book’s step-by-step guides explain the tasks and tools your newbie will need to get the job done right.”
—RoadBikeReview.com

“This smartly organized guide shows how to repair new and old bicycles from top to bottom. Zinn & the Art of Road Bike Maintenance is essential cycling gear for all road and cyclocross riders.”
—CrossBikeReview.com

“Lennard Zinn is an institution in the bicycle world—a legend. Legions of cyclists have learned to repair bikes from him, ridden bicycles he’s built, or used his advice as guidance on how to better enjoy the world on two wheels.”
—Bicycle Times magazine

“Today’s bicycles are complicated machines that can be expensive to maintain and repair. Zinn has written this book to help both the leisure bike rider and expert mechanic handle almost any problem associated with road bikes.”
—Library Journal

“Lennard Zinn really is the world’s most helpful and comprehensive human when it comes to bicycle repair and maintenance.”
—Bike magazine

“Zinn & the Art of Road Bike Maintenance has instructions on anything an aspiring wrench would want to know. What impresses most is Lennard’s overall approach of simplifying a task and reminding us how rewarding it is to perform our own service.”
—Podium Café

“Lennard Zinn is a veritable cycling Einstein and, as a naturally gifted teacher, he has the unique ability to explain even the most difficult mechanical task. So unless you currently ride on a high-profile pro team with your own mechanic (and maybe even then), Zinn & the Art of Road Bike Maintenance is an absolute ‘must-have’ book.”
—Davis Phinney, Olympic medalist, national champion, and Tour de France stage winner
“Zinn & the Art of Road Bike Maintenance is simple, easy to follow, and the illustrations are magnificent. If you are looking for a bicycle repair manual, get this book.”

—Cycloculture

“Lennard Zinn’s book might be the work that launched a 1,000 repair projects. Or, at least, it placated many home mechanics when they started cursing skipped shifts or loose headsets.”

—Canadian Cycling magazine

“If ever there was a classic text on bike maintenance, this has to be it. Like its predecessors, it goes from super simple right through to complete rebuilds. All are explained by a combination of Zinn’s unique humor-filled, insightful, and clear text, with Todd Telander’s brilliant illustrations.”

—220Triathlon.com

“Zinn is very good at taking you incrementally through the learning process—whether you are a beginner or expert mechanic.”

—Out There Monthly magazine

“There really is no other bicycle repair manual like this. Zinn & the Art of Road Bike Maintenance is very up-to-date, very clear—thanks to the profuse illustrations—and accurate and comprehensive. And it’s all in a very enjoyable format intended to be encouraging and confidence-building.”

—USCyclingReport.com

“There is a wealth of excellent info in this rather large tome. Zinn makes little pre-supposition as to the technical abilities of his readers and it’s this aspect that makes you feel that you can manage the majority of the repairs detailed in the book.”

—TheWashingMachinePost.net

“Simple to read and follow, the illustrated, large-format paperback manual features everything from replacing a flat to repairing components. It’s a great addition to any new biker’s library but offers invaluable advice for experts, too.”

—Sports Guide magazine
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INTRODUCTION

First things first, but not necessarily in that order.
—DOCTOR WHO

ABOUT THIS BOOK

So, you want to learn how to care for your road bike? Congratulations. You will be glad you took this step. Although it is nice to learn about your bike from friends or shop employees who know more about bicycles than you do, you don’t want to depend on them for routine maintenance or fixing basic mechanical problems. And the exhilaration of riding with the wind in your hair will be enhanced by understanding the structure of the mechanical system on which you are sitting and to which you are entrusting your life.

Even the purest romantic can follow the simple step-by-step procedures and exploded diagrams in this book and discover a passion for spreading new grease on old parts. And, I hope, everyone will develop an appreciation for how infusing love into the work will guarantee success at bike maintenance. If not, frustration will take over, you will use less care, and your riding enjoyment will be compromised.

Zinn & the Art of Road Bike Maintenance allows you to pick maintenance tasks appropriate for your level of skill and confidence. However, I firmly believe—and my experience with the repair classes I have taught confirms this—that anyone can perform the repairs illustrated on these pages. It takes only a willingness to learn and the appropriate tools.

This book is intended for everyone from experienced shop mechanics to those who only want to know about the most minimal maintenance their bike requires. Chapter 2 is for those whose interest is limited to the latter; the rest of the book is for those who choose to go to greater lengths to make everything work optimally and look clean and beautiful. Even for those who wish to focus on Chapter 2, the information in Appendix C on fitting your bike to you instead of the other way around will increase your riding pleasure and safety.

WHY DO IT YOURSELF?

There are a number of reasons for learning to maintain your bike. Obviously it is a lot cheaper to fix a bike yourself than to pay someone else to do it. Once you have some skill and experience, it is also faster. And home-based maintenance is a necessity for most racers and others who live to ride and have no visible means of support.

As your income increases, economic necessity ceases to be a significant issue. However, you may find that you enjoy working on your bike for reasons other than just saving money. Unless you have a trusted mechanic who services your bike regularly, you are not likely to find anyone who cares as much about your bicycle’s smooth operation and cleanliness as you, or
who will make your bike a priority when you need to have it the next day or in the next few hours. Furthermore, if you love to ride, you need to be able to fix mechanical breakdowns that occur on the road, especially if you ride alone.

If time is your biggest issue, having someone else work on your bike might seem like a no-brainer. But in reality, even finding the time to drop off your bike and pick it up from the shop, while coordinating with the shop’s schedule, can be hard. You may be able to perform a simple repair faster or more conveniently than you can make a trip to the bike shop during working hours. And you won’t like missing a ride during beautiful weather while your bike sits in a shop that is backed up with repairs. Finding out that you can’t just drop off your ailing bike during high season and expect anything faster than a three-week turnaround on a minor repair can ruin your day. Even arranging and adhering to a repair appointment with a shop can be a hassle. Finally, a shop slammed with summer work may return your bike in less than optimal condition because too little time was devoted to the repair or the mechanic was inexperienced. Ultimately, you may decide that having someone else work on your bike creates more aggravation than it alleviates.

Working on your bike can be fun. Bicycles are the manifestation of elegant simplicity. Bicycle parts, particularly high-end components, are a fantastic value. They are made to work well and last a long time. With the proper attention, they can shine in appearance and performance for many years. Satisfaction can be found in dismantling and cleaning a filthy, barely functional part, lubricating it with fresh grease, and reassembling it so that it works like new. Knowing that you made those parts work so smoothly—and that you can do it again when they next need it—is rewarding. You will be eager to ride hard and long to see how your work holds up, rather than being reluctant to get far from home for fear of breaking down.

It is liberating to go on a long ride confident that you can fix just about anything that may go wrong. Armed with this confidence and the tools to put it into action, you will have the freedom to explore new roads and go farther than you may otherwise have gone. You may also find yourself more willing to share your love of the sport with riders who are less experienced. You will enjoy riding with them more if you know that you can fix their questionably maintained bikes, and you can bask in their appreciation after you have eliminated an annoying squeak or a skipping chain.

**HOW TO USE THIS BOOK**

Skim through the entire book. Look at the table of contents and the exploded diagrams, and get the general flavor of the book and what’s inside. When it’s time to perform a particular task, you will know where to find it, and you will have a general idea of how to approach it. Illustrators Mike Reisel and Todd Telander and I have done our best to make these pages as understandable as possible. The exploded diagrams show precisely how each part goes together. Nevertheless, the first time you go through a procedure, you may find it easier to have a friend read the instructions out loud as you perform the steps.

Obviously, some maintenance tasks are more complicated than others. I am convinced that anyone with an opposable thumb can perform any repair on a bike. Still, it pays to spend some time getting familiar with the simple tasks, such as fixing a flat, before throwing yourself into a complex job, such as building a wheel.

Tasks and the tools required to accomplish them are divided into three levels indicating their complexity or your proficiency. Performing level 1 tasks demands level 1 tools and requires of you only an eagerness to learn. Level 2 and level 3 tasks also have corresponding tool sets and are progressively more difficult.

All suggested tools are shown in Chapter 1. At the end of Chapter 2 is the must-read section “A General Guide to Performing Mechanical Work” (2-18); it states general policies and approaches that apply to all mechanical work. (Note that the cross-references list chapter first and then the section within the chapter; for example, 2-18 indicates material found in section 18 of Chapter 2.)

Each chapter starts with a list of suggested tools in the page margin. If a section demands more than basic experience and tools, there will be an icon designating
the difficulty. Tasks and illustrations are numbered for easy reference. If you’re wondering what to do first, a routine maintenance schedule is included at the end of Chapter 2 (2-19). A troubleshooting section is included at the end of some chapters. This is the place to go to identify the source of a certain noise or particular malfunction in the bike. There is also a comprehensive troubleshooting index in Appendix A.

For those into cyclocross, almost every chapter includes a specific cyclocross maintenance section.

Many tasks will be simplified or improved by using the information presented in the appendixes. Appendix B is a complete gear chart and includes instructions on how to calculate a gear if you’re using nonstandard-size wheels or tires. Appendix C is an extensive section on selecting the proper-size bike and positioning it to fit you. It includes information about setting up your bike for time trials or triathlons, as well as road and cyclocross. Appendix D, the glossary, is an inclusive dictionary of bicycle technical terminology. Appendix E lists the tightening (torque) specifications of almost every bolt on the bike. I can’t emphasize enough how useful it is to use a torque wrench to tighten bolts as tightly as the component manufacturer intended, but no tighter. Flag Appendix E so you can flip to it easily whenever you work on your bike.

The Internet can be a useful supplement to this book. For instance, bikeschool.com, dtswiss.com, and other sites have spoke-length calculators to use when you are building wheels.

**THE ROAD BIKE**

This is the creature (Fig. i.1) to which this book is devoted. All of its parts are illustrated and labeled. Take a minute to familiarize yourself with these parts now, and then refer back to this diagram whenever necessary.

The road bike comes in a variety of forms, from road racing (Fig. i.1) to time trial or triathlon (Fig. i.2), to longer-wheelbase touring models, which are rigged for carrying luggage (Fig. i.3), to models with front—and even rear—suspension. Some cousins are the track bike (Fig. i.4) and the cyclocross bike (Fig. i.5).

**THIS MEANS YOU!**

Because this book clearly spells out the steps necessary to properly maintain and repair a road bike, even those who see themselves as having no mechanical skills will be able to tackle problems as they arise. With a willingness to learn and a little practice, you will find that your bicycle will become transformed from a mysterious contraption too complicated to tamper with to a simple machine that is a delight to work on. Just allow yourself the opportunity and the dignity to follow the instructions, take your time, and trust yourself.

So, if you think you are not mechanically inclined, set that opinion aside, along with any other factors that may stand in the way of rolling up your sleeves to improve your bike’s performance. The bicycle is one of our greatest inventions. Another is the book. Here is a chance to use them both. See you on the road!
I.1 The object of our attention (and affection), racing version
I.2 Triathlon or time trial bike

I.3 Touring bike
I.4 Track bike

I.5 Cyclocross bike
You can’t do much work on a bike without a basic tool assortment. Bicycles—like other evolved machines such as automobiles and watches—have specific fasteners and threads that require specific tools to fit them. This chapter will clarify which tools you should consider owning, based on your level of mechanical experience and interest.

As I mentioned in the introduction, the maintenance and repair procedures described in this book are classified by degree of difficulty. Nearly all repairs are classified as level 1, because most bicycle repair jobs are pretty easy to complete once you understand the principles involved. The tools for levels 1, 2, and 3 are pictured in Figures 1.1A, 1.2, and 1.3, respectively, and described on the following pages. In addition, the tools you may need for a specific repair are listed in the margin at the beginning of each chapter.

For the novice, there is no need to rush out and buy a large number of bike-specific tools. The Level 1 Tool Kit (Fig. 1.1A) consists of standard tools, many of which you may already own. This is almost the same collection of tools, in a more compact and lightweight form, that I recommend for carrying on long rides (Fig. 1.6).

The Level 2 Tool Kit (Fig. 1.2) contains several bike-specific tools, allowing you to do more complex work on the bike. Level 3 tools (Figs. 1.3, 1.4) are extensive (and sometimes expensive) and ensure that your riding buddies will show up not only to ask your sage advice but also to borrow your tools. If you are willing to lend tools, you may want to mark your collection and keep a list of who borrowed what, to help recover items that may otherwise take a long time finding their way back to your workshop. I have yet to consistently take this advice and am missing some favorite tools...

**LEVEL 1 TOOL KIT**

Level 1 repairs are the simplest and do not require a workshop, although a well-lit, comfortable workspace is nice to have. For everyday repairs, you will need the following tools (Fig. 1.1A):

- **Tire pump with a gauge** and a valve head to match your tubes (either Presta or Schrader valves; see Fig. 1.1B).
- **Standard screwdrivers**: small, medium, and large.
• **Phillips-head screwdrivers**: one small and one medium.
• **Set of three plastic tire levers**.
• **At least two spare tubes**—or **tubulars** (see Chapter 7)—of the same size and valve type as those on your bike.
• **Container of regular talcum powder** for coating tubes and the inner casings of tires. Do not inhale this stuff; it’s bad for your lungs.
• **Patch kit**. Choose one that comes with sandpaper instead of a metal scratcher. Every year, check that the glue has not dried out.
• **One 6-inch adjustable wrench** (also called a “Crescent wrench”).
• **Pliers**: regular and needle-nose.
• **Set of metric hex keys** (or Allen wrenches) that includes 2.5mm, 3mm, 4mm, 5mm, 6mm, and 8mm sizes. Folding sets are available and keep wrenches organized. I also recommend buying extras of the 4mm, 5mm, and 6mm sizes, and a long-handled 8mm hex key for removing and installing some pedals and crankarms.
• **Torx keys**, which look like hex keys with star-shaped tips; they fit some brake bolts and chainring bolts. Torx T25 and T30 are common sizes on road bikes.
• **A 15mm pedal wrench**. This wrench is thinner and longer than a standard 15mm wrench and thicker and longer than a cone wrench, to fit into the space between the pedal and crank (Fig. 13.4). A pedal wrench is not necessary for pedals with only a hex-key hole and no wrench flats on the spindle (Fig. 13.5).
• **Chain tool** for breaking (opening) and reassembling chains. If you have a 9-, 10-, or 11-speed system, you may need a narrower chain tool to avoid bending the center prongs of the tool. Shimano’s TL-CN34 (Fig. 4.19) works for 7-, 8-, 9-, 10-, and 11-speed chains. Many other chain tools work as well (Figs. 4.20–4.23); you can ask your bike shop for the brand of tool that matches the brand and size of the chain on your bike.
• **Chain-elongation gauge**. This handy little item helps you determine whether a chain needs to be replaced (Figs. 4.5, 4.6). An accurate 12-inch ruler will substitute adequately.

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1.1A Level 1 Tool Kit

- **Spoke wrench** to match the size of the spoke nipples on your bike’s wheels.
- **Tube or jar of grease**. I recommend using grease designed specifically for bicycles, but standard automotive grease is okay.
- **Drip bottle or can of chain lubricant**. Choose a nonaerosol; it is easier to control, uses less packaging, and wastes less in overspray.
- **Rubbing alcohol** for cleaning brake tracks on rims and discs, doing other light cleaning, and removing and installing handlebar grips, if you have them instead of handlebar tape.
- **Electrical tape** for taping off the end of the handlebar tape, marking your seat height, covering frame holes, etc.
- A lot of **rags**! Old T-shirts work fine.
- **Safety glasses**.
- **Rubber gloves** or a box of cheap latex gloves.
A bucket, dish soap, large brushes, and sponges (Fig. 1.7). These will serve you well for cleaning a dirty machine rapidly.

1-2

**LEVEL 2 TOOL KIT**

Level 2 repairs are a bit more complex, and I recommend that you attack them with specific tools and a well-organized workspace with a shop bench. Keeping your workspace well organized is probably the best way to make maintenance and repair easy and quick. You will need the entire Level 1 Tool Kit (Fig. 1.1A) plus the following Level 2 Tool Kit tools (Fig. 1.2), which of course you can buy as you need them:

- **Portable bike stand.** The stand must be sturdy enough to remain stable when you’re really cranking on the
wrenches. If you have a bike with an aero seatpost or integrated seat mast, you won’t be able to clamp it in a standard bike stand, which is designed to clamp round tubes. In that case, you will need a bike stand that holds the bike by the bottom bracket and the front or rear end with one wheel out. It will have a cradle for the bottom bracket to sit in and a sliding clamp on a long horizontal arm with a quick-release mount to clamp either the fork ends or rear dropouts (see the race mechanic’s bike stand in Fig. 1.4). Alternatively, you can use an adapter that holds the frame and can be clamped itself in a standard bike stand.

- **Shop apron** to keep your nice duds nice.
- **Hacksaw** with a fine-toothed blade or a sintered blade for hard materials and composites.
- Set of **razor blades** or a sharp **shop knife** (box cutter).
- **Files**: one round and one flat, with medium-fine teeth.
- **Cable cutter** for cutting coaxial shift cable housing without crushing as well as for cutting brake and shift cables without fraying the ends. If you purchase a SRAM, Shimano, Park, Pedro’s, or Jagwire housing cutter, you won’t need to buy a separate cable cutter, because all of these cut cables as well as housings.
- Set of **metric socket wrenches** that includes 7mm, 8mm, 9mm, 10mm, 13mm, 14mm, and 15mm sizes. This assumes you have a ratchet handle; if not, get one.
- **Chainring-nut tool** for holding the nut while you tighten or loosen a chainring bolt.
- Medium **ball-peen hammer**.
- Medium-size **bench vise**, bolted securely to a sturdy bench.
- **Cog lockring tool** for removing cogs from the rear hub (Figs. 8.21, 8.22). Note that Campagnolo lockrings require a different tool than Shimano, SRAM, and Mavic.
- **Chain whip** or **Pedro’s Vise Whip** for holding cogs while loosening the cassette lockring. The Vise Whip will hold the cog more firmly (Fig. 8.21) than will the chain whip (Fig. 8.22).
- **Bottom-bracket tools**. For external-bearing cranks (Figs. 11.2, 11.8, 11.19), you’ll need an oversized splined wrench (external-bearing tool) to remove the cups (Fig. 11.19) and, for Shimano Hollowtech II cranks, a
- chaining-nut tool
- medium bench vise
- chain whip
- Pedro’s Vise Whip
- cog locking tool
- carbon-grip compound
- ball-peen hammer
- chainring-nut tool
- ball joint (Channellock) pliers
- snapring pliers
- splined cartridge bottom-bracket tool
- integrated-spline tool
- bottom bracket tools: toothed locking spanner (top), pin spanner (bottom)
- cone wrenches
- crank puller
- toothed lockring spanner
- pin spanner
- metric open-end/box-end wrenches
- chainring-nut tool
- integrated-spline tool
- Nolubes valve-core remover
- Presta valve-core remover
- Schrader valve-core remover
- woodworker’s miter clamp (tubular tires)
- degreaser
- chainring-nut tool
- integrated-spline tool
- splined pedal-spindle removal tool
- Presta valve-core remover
- sound system
- headset wrenches
- bike wash fluid
- degreaser
- penetrating oil or ammonia
- threadlock fluid
- rags
- medium bench vise
- sound system
- integrated-spline tool
little splined tool to tighten the left crank's adjustment cap (Fig. 11.3). For Campagnolo Ultra-Torque integrated-spindle cranks (Fig. 11.8), you'll also need a long, 10mm hex key to tighten the bolt in the middle of the axle. For sealed cartridge bottom brackets (Figs. 11.21, 11.25), you'll need the splined cartridge bottom-bracket tool (Fig. 11.34). Note that if you have an ISIS or Octalink splined-spindle bottom bracket, you need a splined tool with a bore large enough to swallow the fatter spindle (Fig. 11.25). And for cup-and-cone bottom brackets (Fig. 11.22), you'll need a lockring spanner and a pin spanner to fit the bottom bracket (Fig. 11.37).

• Snapring pliers for BB30 cranks (Fig. 11.17) and other unthreaded bottom brackets with snapring grooves (Fig. 11.33). Also useful for removing snaprings from pedals, PRO seatposts for Shimano Di2 batteries, and other parts.

• Crank puller for removing crankarms (Fig. 11.7). This tool is only necessary for older cranks; it is not needed for integrated-spindle cranks (Figs. 11.2, 11.8, 11.15–11.19) or for cranks with self-extracting crank bolts. The pushrod of this tool is sized for either square-taper spindles (Figs. 11.21–11.23) or ISIS/Octalink spindles (Figs. 11.24, 11.25) but not both, so get the right one for your crankset.

• Cone wrenches for loose-bearing hubs (Figs. 8.8, 8.12). The standard sizes are 13mm, 14mm, 15mm, and 16mm, but check which size you need before buying.

• Slip-joint pliers (also called “Channellock” pliers).

• Splined pedal-spindle removal tool. Note that Shimano’s plastic tool (Fig. 13.14) is different from Look’s, although high-end Shimano and Look pedals no longer require either (they take standard 20mm and 19mm wrenches).

• For older bikes, a set of metric open-end wrenches that includes 7mm, 8mm, 9mm, 10mm, 13mm, 14mm, 15mm, and 17mm sizes.

• Two headset wrenches (only needed for older bikes with threaded headsets; Figs. 12.1, 12.8, 12.11, 12.23). Check the size of the headset on your bike before buying.

• Rim cement for tubular tires, if you have them. Use Continental clear glue or Vittoria Mastik’One for aluminum rims, but stick to Mastik’One for carbon-fiber rims. See Chapter 7 for more options.

• Valve-core remover for Presta or Schrader valves. Some tools have separate ends for both, while other tools like Stan’s NoTubes can remove both Presta and Schrader valves.

• Carbon-grip compound for the clamping areas of carbon seatposts and handlebars to keep them from slipping.

• Tire sealants and sealant injector syringe to prevent or fill small punctures and to set up tubeless tires.

• Woodworker’s miter clamp for gluing tubulars (optional).

• Sound system, if you plan on spending a lot of time working on your bike.

• Threadlock fluid, specialty bike-wash fluid, degreaser, penetrating oil (or ammonia for breaking free stuck parts), antiseize grease for titanium bolts will all come in handy, along with a small stack of shop rags.

LEVEL 3 TOOL KIT

If you are an accomplished level 3 mechanic, you are completely independent of your local bike shop’s service department. You can even build a complete bike from a bare frame. By now, you have a well-organized, separate space intended solely for working on your bike. Some elements of the Level 3 Tool Kit (Fig. 1.3) are more accurate or heavy-duty replacements for tools in the Level 2 Tool Kit.

• Parts washing tank. Use an environmentally safe degreaser. Dispose of used solvent responsibly; check with your local environmental safety office.

• Fixed bike stand (optional). Be sure it comes with a clamp designed to fit any size of frame tube.

• Master-link pliers (Fig. 4.25).

• A tire pressure gauge separate from the one on a floor pump is more accurate at low pressures and can save time.

• A telescoping or articulating magnet for picking up dropped parts or small tools.

• Large ball-peen hammer.
1.3 Level 3 Tool Kit

- master-link pliers
- headset/PF30 cup remover rocket
- star-nut installation tool
- freewheel removers
- fine-tip grease gun
- Mavic hub pin spanner
- metric hex-key and Torx bits
- contact cement
- spoke wrench
- torque wrench
- large ball-peen hammer
- soft mallet
- tire pressure gauge
- needle for leather, braided fishing line (tubular tires)
- parts washing tank
- fixed bike stand
- large vise
- metric thread taps
- simple headset press
- Campagnolo chain tool
- Shimano chain tool
- cassette
- extra drive-train parts (spare parts)
- extra brake and derailleur cables (spare parts)
- zip tie
- cassette
- chain
- contact cement
- patience . . . ommmmmm . . .
• **Soft mallet.** Choose leather, rubber, plastic, or wood to prevent damage to parts.

• **Headset press** used to install headset bearing cups (Fig. 12.44) and bearings and bearing cups into threadless bottom-bracket shells (Fig. 11.29). The press should not push on the bearing’s inner race; if it does, get the appropriate insert to adapt your headset press to the particular headset and bottom-bracket bearings and cups you will be installing.

• **Headset-cup and PF30 bottom-bracket remover.** Often called a “rocket” tool due to its shape, this tool expands inside the head tube (Figs. 12.37, 12.38) or bottom-bracket shell behind the bottom bracket or headset cup.

• **Small press-fit PF24 (BB86) bottom-bracket remover.** Identical to a headset remover rocket but smaller for the press-fit bottom brackets for cranksets with 24mm integrated spindles.

• **Fork-crown race punch** (a.k.a. “slide hammer”) for installing the fork-crown headset race (Fig. 12.43). Thin crown races require a second support tool to protect the crown race during installation.

• **Star-nut installation tool** for threadless headsets in metal fork steerer tubes.

• **Freewheel removers.** If you will be working on retro stuff, you’ll need these for unscrewing freewheels from threaded hubs. Different freewheels take different removers, so only buy as you need them.

• **Torque wrenches** for checking proper bolt tightness. Most component manufacturers provide torque specs to prevent parts from stripping, breaking, creaking, or falling off while riding. There is a torque specification list in Appendix E of this book. You need a long torque wrench that goes to high torque for big items like crank bolts, bottom-bracket cups, and pedals, and a short torque wrench accurate at low torque settings for small items like stem bolts, shoe cleat bolts, and cable-clamp bolts. Also get a set of **metric hex-key and Torx bits** to fit the wrenches.

• **Set of metric thread taps** that includes 5mm × 0.8mm, 6mm × 1mm, and 10mm × 1mm. These will thread bottle bosses, seat binder clamps, derailleur hangers, and cantilever bosses (on touring or cyclocross frames).

• **Fine-tip grease gun** for parts with grease fittings and for Campagnolo headsets with grease holes.

• **Outboard motor gear oil** for lubricating some free-hubs.

• **Truing stand** for truing and building wheels.

• **Dishing tool** for checking whether wheels are properly centered.

• **Spoke wrenches** for the wheels you own; you may require a splined one for splined nipples or a socket-type for wheels with internal nipples.

• **Pin spanner** for adjusting Mavic hubs.

• **High-quality chain tool** for chain installation. A rudimentary chain-breaker tool will be fine for occasional use, but you’ll be much better off with a good one, particularly for 10- and 11-speed chains; see Pro Tip on chain tools in 4-12.

• **Needle** made for sewing leather, braided **fishing line**, and **contact cement** for patching tubular tires.

• One healthy dose of patience and an equal willingness to work and rework jobs until they have been properly finished.

**Other Stuff**

• **Spare parts** to save you from having to make a lot of last-minute runs to the bike shop for commonly used parts. Any well-equipped shop really requires several sizes of ball bearings, bolts, spare cables, cable housing, housing ferrules (cylindrical housing end caps), cable-end caps, valve extenders, and zip ties. You should also have a good supply of spare tires, tubes, chains, and cogsets.

The following tools (Fig. 1.4) go well beyond the Level 3 Tool Kit and sure come in handy when you need them.

• **Bottom-bracket tap set.** This tool cuts threads in both ends of the bottom bracket while keeping the threads in proper alignment. English threaded taps are required for most modern road bike frames. Most Italian-made metal frames, however, have Italian threads and will require appropriate taps. French
threading and Swiss threading are separate standards and are extremely rare.

- **Pre-set torque keys** are faster for tightening stem bolts, cleat bolts, and other small bolts. These torque key handles accept standard hex-drive tool bits and are pre-set to a given torque setting. Most of them click over when the pre-set torque is reached; CDI pre-set torque keys ratchet when the torque setting is reached (like an automotive gas cap) and won’t allow over-tightening.

- **Bottom-bracket facer.** This tool cuts the faces of the bottom-bracket shell so that they are parallel.

- **BB30 reaming cutter and backing plate (base plate)** that fit on bottom-bracket tap handles.

- **Bearing press/puller** for popping cartridge bearings in and out of external bottom-bracket cups.

- **Park BBT-39 bearing remover** for BB30 and BB90 bottom brackets.

- **B Bushings** for pressing in bottom-bracket bearings and cups.

- **Park CBP-5 and CBP-3 bearing puller** for Campagnolo/ Fulcrum Ultra-Torque bottom brackets, **arm puller, plug and pads** for Campagnolo Power Torque cranks, and **bearing puller extension** for removing Campagnolo Power Torque drive-side bearing.

- **Electric drill** with drill bit set for customizing. A cordless drill with an adjustable torque collar and a Torx T25 bit will install 6-bolt disc rotors in a jiffy.

- **Dropout-alignment tools** (a.k.a. “tip adjusters”).

- **Derailleur-hanger-alignment tool** to straighten the derailleur hanger after you shift the derailleur into the spokes or crash on it. If your bike has a replaceable derailleur hanger, keep an extra hanger around.

- **Chain keeper** attaches to dropout to hold chain while cleaning drivetrain with wheel off.

- **Cog-wear-indicator gauge** determines whether cogs are worn out.

- **Three-way internal-nipple spoke wrench** with square-drive, 5mm, and 5.5mm sockets for the purpose of tightening spoke nipples internal to a deep rim. A specialty wrench may be needed for a non-standard internal nipple.

- **Spoke nipple screwdriver** with bent, free spinning shaft for quicker wheelbuilding.

- **Hub bearing press.** This tool has bushings for all bearing sizes and ensures that cartridge bearings press in aligned with each other.

- **Antitwist tool** for preventing bladed (aero) spokes from twisting during truing; Mavic and DT make good ones.

- **Spoke-tension gauge.** Brings spoke tension up to precise specs for long-lasting, stable wheels.

- **Shimano TL-EW02 plug-in/out tool for Shimano Di2 electrical connectors** (Fig. 6.13A).

- **Magnetic wire-fish tool.** The magnet on the end of the fishing cable pulls electronic wires, cables, housings, and hydraulic hoses through the frame by means of a mating magnetic wire that grabs the connector. Campagnolo offers the tool shown here, specific to its EPS electronic wires. Park Tool’s IR-1 Internal Cable Routing Kit (Fig. 5.30) has three magnetic wires and works for EPS and Di2 wires, as well as for standard shift and brake cables and for cable housings and hydraulic hoses.

- **Head-tube reaming and facing tool.** This tool keeps the two ends of the head tube parallel and bored out to the right size.

- **Park universal fork-crown-race remover.** This hefty tool can remove a fork-crown race from any shape of fork without using a hammer and screwdriver and suffering consequent collateral damage to the fork.

- **Heavy-duty headset press** installs headset bearing cups (Fig. 12.44) and bottom-bracket bearings and bearing cups into threadless bottom-bracket shells (Fig. 11.29) more quickly and accurately than a simple threaded headset press can. The press should not push on the bearing’s inner race; if it does, get the appropriate insert to adapt your headset press to the particular headset and bottom-bracket bearings and cups you will be installing so that the insert presses only on the outer bearing race.

- **Digital chain-elongation gauge.** Precise monitoring of the gradual increase in chain length allows timely chain replacement without overdoing it.

- **Hydraulic hose cutter.** Hydraulic disc-brake hoses that are cut off cleanly and straight are less likely to leak.

- **Rotor-alignment dial indicator.** Rapidly finds out exactly where a disc brake’s rotor is out of true.
1.4 Tools for the well-stocked shop

- **Rotor-alignment levers.** Use in conjunction with dial indicator to precisely bend the rotor into alignment.
- **Cutting guide for threadless steering tubes.** The guide slot keeps the hacksaw blade lined up perpendicular to the steerer. Park makes a good one.
- **Crowfoot sockets.** Turn big nuts and bottom-bracket cups, including splined cups, to precise torque settings. Have the crowfoot at 90 degrees to the torque wrench handle to achieve torque setting shown on the wrench handle (i.e., if the crowfoot is extended straight out or back, it multiplies or reduces the torque setting shown on the wrench handle).
- **Feeler gauges.** Measures precision of disc-brake pad spacing from the rotor.
- Measuring **caliper** with a vernier dial, or an electronic gauge, to precisely measure parts.
- **Axle-clamp tool** for clamping the end of a hub axle in a vise.
• **Air compressor** to make quick work of mounting tires.
• **Prestacycle tire inflator.** Hook this baby up to your air compressor to inflate to exact pressure quickly.
• **Prestacycle valve chucks.** Inflate accurately regardless of the type or geometry of access of tire valves.
• A European-style **race mechanic’s bike stand**, which supports the bottom bracket and has a long arm with a quick-release clamp to hold the fork ends or the rear dropouts, can be the only way to work efficiently on a bike with an integrated seat mast or an aero seatpost, as there is no way to clamp such a bike in a conventional work stand. Alternatively, **Hirobel’s Carbon Frame Clamp adapter** for carbon frames that do not have round tubes or a round seatpost allows you to safely hold them with a standard repair stand.

### Setting Up Your Home Shop

Make your shop clean, well organized, and comfortable, and you’ll find that the speed and quality of your work will improve. Hanging tools on pegboard or slatboard or placing them in drawers, bins, or trays helps maintain an organized work area. Being able to lay your hand on the tool you need will increase the enjoyment of working on a bike. It is hard to do a job with loving care when you can’t find the cable cutter. Placing small parts in a bench-top organizer, one with several rows of little drawers, is another good way to keep chaos at bay.

### Tools to Carry on a Ride

#### a. For everyday rides

You can keep everything you need for light repairs (Fig. 1.5) in a **small bag** under your seat, in a backpack, or even in a jersey pocket. Look for tools and parts that are light and serviceable. I suggest getting the ones you want in a combination “multitool”; you can even get a lot of them combined into a rear quick-release hub skewer with the Pedro’s Túlio! Test all tools at home before taking them on the road.

- **Spare inner tube** or **tubular.** Always carry one. Make sure the valve matches the ones on your bike and is sufficiently long for your rim depth. If rarely needed, keep it in a plastic bag to prevent deterioration.
- **Tire pump** or **air cartridge.** Longer is better for pumping but heavier for carrying. Road bike pumps need to be thin to attain high pressures. Minipumps are compact, but they’re slow. Make sure the pump head matches the tire valves (Presta or Schrader). If you
prefer CO₂ cartridges, get the correct volume for the spare tube or tubular (probably 12g [grams], unless you are filling a huge touring tire, in which case you may need a 16g cartridge). Keep in mind that if you are running sealant inside of a tubeless tire, using CO₂ cartridges to inflate them will tend to solidify the sealant.

- At least two plastic tire levers, preferably three (for clinchers and tubeless tires).
- **Patch kit.** You’ll need this if you puncture your spare tube. Check it at least once a year to make sure the glue has not dried out. You can also carry glueless patches.
- **Small screwdrivers** for adjusting derailleurs and other parts; ideally on a multitool.
- Compact set of hex keys that includes 2.5mm, 3mm, 4mm, 5mm, 6mm, and 8mm sizes; a folding set or multitool is a good investment.
- **Torx T25 key**, ideally on a multitool, if the disc brake bolts have Torx heads.
- For pre-1980s bikes, bring 8mm and 10mm open-end wrenches. These are often included on some older multitools, eliminating the need to bring separate wrenches.
- **Small clip-on taillight.**
- Warm outerwear. Arm warmers, knee warmers, nylon vest or jacket, and a cap for a ride in the mountains or on any cool day. In the mountains and in questionable weather, thin gloves and shoe covers are also a good idea.
- **Identification.**
- **Cash** for food, phone calls, and to boot sidewall cuts in tires.
- **Cell phone.** As if I had to remind you to bring your phone! It can come in handy, although it can also interrupt your rides.
- **GPS computer** to find your way when lost, if your phone doesn’t have this capability.

**b. For long or multiday trips**

Carry the items in Figure 1.6, as well as all of the items in Figure 1.5.

- **Spare folding clincher tire** and a second **spare inner tube**; if you ride tubulars, bring two spares of those.
• Rain gear.
• Spoke wrench that fits your wheels’ nipples (can be on a multitool).
• Chain tool in case you break the chain. Chain tools (or “chain breakers”) are often included in compact multitools, eliminating the need to bring a separate chain tool (as well as screwdrivers, hex keys, and even box-end or open-end wrenches and spoke wrenches). Try the chain tool at home on spare links you removed when installing new chains to make sure that you can repair the chain 100 percent of the time. This testing is important insurance on long solo rides that include extended stretches away from civilization or cell phone coverage.
• Spare chain links from your chain. If you are using a Shimano 8- or 9-speed chain, bring at least two subpin rivets or master links of that width. For 10- or 11-speed chains, bring master links for that width chain.
• Spare spokes of the right lengths for your wheels. Or, if you prefer, FiberFix sells a cool folding spoke made from Kevlar. It’s worth getting one for emergency repairs on a long ride. See Chapter 3 for directions on how to use it.
• Small plastic bottle of chain lube.
• Sealant-filled compressed-air tire inflators. Especially if you’re using tubulars (which you can’t patch on the road), an inflator with sealant can get you home if you’ve ridden through thorns or over a tack.
• Small tube of grease.
• Small amount of duct tape.
• Small amount of wire and/or zip ties.
• Compact 15mm pedal wrench if your bike requires it. Be sure to get one with a headset wrench on the other end, if your bike requires that as well.
• Headlight. This can be a lightweight unit to clip onto the handlebar or a headlamp with a strap that will fit over your helmet.
• Matches.
• A lightweight, aluminized, folding emergency blanket.

**NOTE:** Read Chapter 3 on emergency repairs before embarking on a lengthy trip. If you are planning a bike-centered vacation, be sure to take along at least a Level 1 Tool Kit in your car, some headset wrenches (if your bike has a threaded headset), and incidentals like duct tape and sandpaper. Also pack a few extra tires, a sturdy floor pump, and a spare derailleur hanger.
TOOLS FOR CYCLOCROSS RACING

Cyclocross races always have a “pit” where mechanics clean bikes and perform repairs and riders exchange dirty bikes for clean ones. Often the pit is set up in two directions, meaning that they can pick up a clean bike every half lap. If you are performing mechanic service for a fast friend (maybe you are switching off, each doing service for the other if you race in different categories), you may have less than five minutes to clean the bike (and fix anything that your buddy yelled wasn’t working when dropping it off) before he or she is back expecting a clean bike again. In a muddy race, you have to be efficient, which means having the correct tools (Fig. 1.7) as well as the right clothing and a calm demeanor.

- **Digital tire pressure gauge.** Accuracy is critical at low pressures with low-volume cyclocross tires.
- **Waterproof pants.**
- **Rubber gloves.**
- **Rubber boots.**
- Warm and/or waterproof jacket and hat, as conditions mandate.
- **Spare bike** set up the same as the bike the rider starts on (i.e., same pedals, same saddle and handlebar position, same type and number of cogs).
- **Spare wheels** with the same type cogs (i.e., same or compatible brand, same speeds) and same brake discs as the bikes have.
- **Spare shift and brake cables, chain links, and master links.**
- **Spare saddle, seatpost,** and seat binder clamp. You’d be amazed how often these parts break in cyclocross.
- Two or three large, stable, reusable buckets, ideally that nest together.
- **Large sponge(s).**
- **Large brush.**
- Small, stiff cylindrical brush and/or narrow brush with long, thin bristles.
- Curved plastic cog pick.
- Environmentally friendly bike cleaner or dish soap.
- Environmentally friendly degreaser.
- Chain lube.
- 3mm, 4mm, 5mm, 6mm, 8mm, and 10mm **hex keys** and Torx T25 and T30 keys, two of each in case you lose some in the mud. Don’t waste precious minutes searching for lost tools; find them after the race.
- **Long, thin screwdriver** for derailleur adjustment and cleaning mud out of tight spaces.
- **Large screwdriver.**
- **Scissors.**
- **Pliers.**
- **Cable cutter.**
- **Floor pump.**
- **Chain keeper** attaches to dropout to hold chain while cleaning drivetrain with wheel off.
- **Crank puller,** if the bike requires more than a hex key to remove the crank.
- **Spoke wrench.**
- **Duct tape.**
- **Chain tool.**
- **Fresh water.** Lots, if it’s a muddy race.
- **Rags.** Lots.

One quick way to equip yourself for the task is with Pedro’s Pit Kit: a bucket containing a sponge, brushes, tools, bike cleaners, degreasers, and lubricant. Its lid allows you to toss other tools in it and keep everything together in the car and when walking to the pit. Use earth-friendly lubes and cleaners; after all, you are generally doing this in a public park, an open field, or some generous institution’s lawn, and you don’t want to despoil it with diesel fuel or other toxic solvents.

**Other stuff**
- A portable bike stand can come in handy.
- If you expect a muddy race and your buddy is a superstar, you can bring a portable pressure washer, either rechargeable battery-powered or gas-powered. Races often supply a communal pressure washer (or a hose), which is great unless it’s frozen or the wait is too long to get the bike clean before your rider comes back around. Make sure you have enough water; if there’s no pond or lake to pull from at the race site, you’ll need a large rain barrel with a hose fitting at the bottom, available at garden stores. Also be sure you have enough battery power or gas to run the compressor through the race.

- **Environmentally friendly bike cleaner or dish soap.**
1.7 Tools for cyclocross racing

- Jacket and hat
- Rubber gloves
- Rubber boots
- Spare chain links
- Spare master links
- Extra brake and derailleur cables (spare parts)
- Spare seat and seatpost
- Spare wheels
- Waterproof pants
- Bike cleaner
- Degreaser
- Buckets
- Rags
- Sponge
- Cylindrical brush
- Brush
- Chain tool
- Chain lube
- Hex keys
- Cog pick
- Scissors
- Spoke wrench
- Pliers
- Duct tape
- Digital tire pressure gauge
- Portable bike stand
- Crank puller
- Large screwdriver
- Chain tool
- Chain keeper
- Chain keeper
- Floor pump
- Long, thin screwdriver
- Torx T25, T30 keys
- Cable cutter
- Pressure sprayer
- Sponge
Always check your bike before heading out on a ride. This inspection can help you avoid injury as well as getting stranded far from home due to parts failure. You should know how to remove and reinstall a wheel so that you can deal with minor annoyances like flat tires or jammed chains. And even if you do nothing else to your bike, keeping its chain clean and properly lubricated, as outlined in this chapter, will make every ride smoother and quieter.

All of the tasks in this chapter require minimal tools, so I have designated the work as level 1 throughout.

**PRERIDE INSPECTION**

1. Check that the wheel quick-release levers or axle nuts (which secure the hub axle to the dropouts) are tight.
2. Check the brake pads for excessive or uneven wear.
3. Grab and twist the brake pads and brake arms to make sure that the bolts are tight. With disc brakes, check that the caliper is tight.

4. **Squeeze the brake levers.** A good squeeze should bring the pads flat against the rims (or brake rotor) without hitting the tires. Make certain that you cannot squeeze the levers all the way to the handlebar. See Chapter 9 for brake cable adjustment (Chapter 10 for disc brakes).

5. **Spin the wheels while eyeing the rims, not the tires.** Check for wobbles. Make sure that the rims or rotors do not rub the brake pads.

6. **Spin the wheels again, this time eyeing the tires.** Check for wobbles. If a tire wobbles excessively on a straight rim, it may not be fully seated in the rim. There is usually a mold line or an edge of a tape strip on the tire that should be parallel to the rim edge all the way around. Look for areas where the tire bulges and/or the mold line or tape edge is higher above the rim or deeper into the rim than the rest of the way around the tire. To fix an improperly seated tire, you need to completely deflate the tire, carefully seat it uniformly all the way around, and then inflate it to the proper pressure.

7. **Check the tire pressure.** On most road bike tires, the proper pressure is between 80 and 120 pounds per square inch (psi). Look to see
that there are no foreign objects sticking in the tire. If there are, you may have to pull the tube out and repair or replace it. If you have an aversion to fixing flats, turn to the section on tire sealants (i.e., goop inside the tube that fills small holes) in Chapter 7 (7-15).

8. Check the tires for excessive wear, cracking, bulges, or gashes.
9. Make certain that the handlebar and stem are tight and that the stem is lined up with the front tire.
10. Check that the gears shift smoothly and the chain does not skip or shift by itself. Ensure that each indexed (click) shift moves the chain one cog, starting with the first click. Make sure that the chain does not overshift the smallest or biggest rear cog or the inner or outer front chainring, which would throw the chain off to one side or the other.

11. Check the chain for rust, dirt, stiff links, or noticeable signs of wear. It should be clean and lubricated (but not overlubricated; gooey chains pick up lots of dirt). The chain should be replaced on a road bike about every 1,500 to 3,500 miles of paved riding. See 4-6 to accurately evaluate chain wear.

12. Apply the front brake and push the bike forward and back. The headset (fork bearings; see Fig. 12.1) should be tight and not make clunking noises or allow the fork any fore-aft play.

13. Ensure that the crank bearings and crankarms are not loose. Grasp one crankarm and push and pull it laterally, toward and away from the frame, checking for play.

14. Ensure that the hub bearings are not loose. Check for bearing play by grasping each wheel around the rim and tire and pushing it side to side.

15. Check that the saddle is tight and straight. Make sure it does not wobble or twist easily.

16. If all this checks out, go ride your bike! If not, check the table of contents, go to the appropriate chapter, and fix the problems before you go out and ride.

REMOVING AND INSTALLING THE FRONT WHEEL

You can’t fix a flat if you can’t remove the wheel. Front wheel removal is also generally required for placing a bike on a roof rack or in a car. As outlined in the following sections, wheel removal usually involves releasing a rim brake (in most cases) before opening the hub quick-release, bolt-on skewer, or the axle nuts. A through-axle requires also pulling out the axle.

To install the front wheel, leave the caliper rim brake open (or the tire deflated, if there is no brake quick-release and the tire won’t fit through the brake while inflated) and slide the tire past the brake pads while lowering the fork onto the wheel so that the bike’s weight pushes the top of the dropout slots down onto the hub axle. This action will seat the axle fully into the fork and center the rim between the brake pads. The procedure is the same with a disc brake except you don’t have to worry about opening the brake; you merely slip the disc rotor between the brake pads in the caliper and follow the rest of the earlier instructions.

If the fork or wheel is misaligned, you will need to readjust the brake or hold the rim centered between the brake pads when securing the hub (and as soon as you can, true the untrue wheel—see 8-2—or get the bent fork fixed or replaced).

RELEASING THE BRAKE

Most rim brakes have a quick-release (QR) mechanism to open the brake arms so that they spring away from the rim, allowing the tire to pass between the pads. Most road bike sidepull brake calipers have a lever that you flip up to open the brake (Fig. 2.1). Alternatively, Campagnolo Ergopower systems have a pin near the top of the brake lever that you push outward to allow the lever (and consequently the caliper) to open wider (Fig. 2.2). Cheap sidepull brakes on cheap bikes—as well as early sidepull brakes on classic racing bikes from the late 1960s and early 1970s—don’t have a quick-release for the brake. The same is often true with time trial bikes and triathlon bikes, as well as bikes with Campagnolo brake calipers coupled with non-Campagnolo aerodynamic brake levers on the ends of bullhorn bars (see Fig. i.2).

If the brake has no quick-release and the tire is not skinny enough to slip past the brake pads as the wheel is removed, you need to deflate the tire to avoid damag-
Another type of cantilever brake, less common on road and cyclocross bikes because of limited compatibility with the brake levers on drop bars, is commonly called a “V-brake” (Fig. 9.47), after a popular Shimano design. Mountain-bike V-brakes are incompatible with drop-bar brake levers because more cable pull is required to move the long brake arms than they can provide. Short-arm road/cyclocross V-brakes work better with road levers, but care is still required when pulling the front brake due to their high leverage. A V-brake is released by pulling the end of the curved cable-guide tube (the “noodle”) out of the horizontal link atop one of the brake arms while squeezing the pads against the rim with the other hand.

Disc brakes (Figs. 10.1–10.2) require no release of the pads; the rotor should simply drop straight down out of the slot in the caliper.

2.1 Releasing the brake

![Image of brake release](image1)

Center-pull brakes (rare now, but common on pre-1975 bikes; see Fig. 9.3) have a cable-hanger yoke that must be pulled down to release it from the straddle cable that connects to the brake arms; squeeze the brake pads against the rim with one hand and release the yoke from the cable with your other hand.

Some cyclocross bikes and touring bikes have cantilever-type brakes (Figs. 9.23–9.43) that mount on pivots attached to fork legs or seatstays. Most standard cantilever brakes are released by holding the pads against the rim with one hand and pulling the enlarged head of the straddle cable out of a notch in the top of the brake arm with the other hand. Really old cantilever brakes are released like the center-pull brakes mentioned in the previous paragraph.

2.2 Releasing a Campagnolo brake

![Image of Campagnolo brake release](image2)

2.3 Opening a quick-release skewer

![Image of quick-release skewer](image3)
ABOUT THE AUTHOR

LENNARD ZINN is a bike racer, frame builder, and technical writer. He grew up cycling, skiing, whitewater rafting, and kayaking as well as tinkering with mechanical devices in Los Alamos, New Mexico. After receiving his physics degree from Colorado College, he became a member of the U.S. Olympic Development (road) Cycling Team. He went on to work in Tom Ritchey's frame-building shop and has been producing custom road, triathlon, and mountain frames, as well as custom cranks and stems, at Zinn Cycles since 1982.


ABOUT THE ILLUSTRATORS

A former mechanic and bike racer, TODD TELANDER devotes most of his time these days to artistic endeavors. In addition to drawing bike parts, he paints and draws wildlife and landscapes for publishers, museums, design companies, and individuals. You can see more examples of his work on his website, www.toddtelander.com.

MIKE REISEL is a graphic designer who spends most of his time art directing magazines, riding his bike, and ignoring the pleas to lubricate his drivetrain.
Zinn Will Help You Fix Your Bike!

You’re holding the world’s best-selling do-it-yourself guide to how to repair your bicycle. Lennard Zinn’s easy-to-follow instructions will help you make quick work of any maintenance and repair job on any road or cyclocross bike. Learn how to take care of every part of your bicycle: basic tune-ups; derailleur adjustment to fix shifting problems; how to true a wheel, fix a flat, adjust brakes, maintain or replace a chain, troubleshoot noises, service a bottom bracket—it’s all here, with hundreds of detailed illustrations of how parts go together and time-saving tips for doing the job right. Itemized lists explain which tools you’ll need, whether you are stocking a workshop or tackling a roadside repair.

No matter what type of road bike you own, old or new, Lennard Zinn’s clear instructions will help you maintain it, fix it, upgrade it, and keep it running smoothly for years to come. Everything you need to know about your bike is in this book!

Bicycle Basics
- How to do your own bike fit
- Simple instructions for regular bicycle care

Complete Bike Repair
- How to fix every bike part: brakes, wheels, tires, headsets, pedals, derailleurs, chains, hubs, handlebars, seatposts, saddles, shifters

Solve Common Bicycle Problems
- Diagnose and fix problems like a skipping chain, rough shifting, squeaky brakes, loose spokes, or a stuck seatpost

The Ultimate Reference
- Exhaustive troubleshooting index, glossary of terms, torque specifications, gear chart for compact and regular cranks

Lennard Zinn is the world’s leading expert on bike maintenance and repair. He was a member of the U.S. national racing team and has been riding and fixing bikes for more than 50 years. A professional frame builder and bike designer, Lennard is also a technical writer for VeloNews magazine and hosts the popular Tech Q&A column on VeloNews.com.