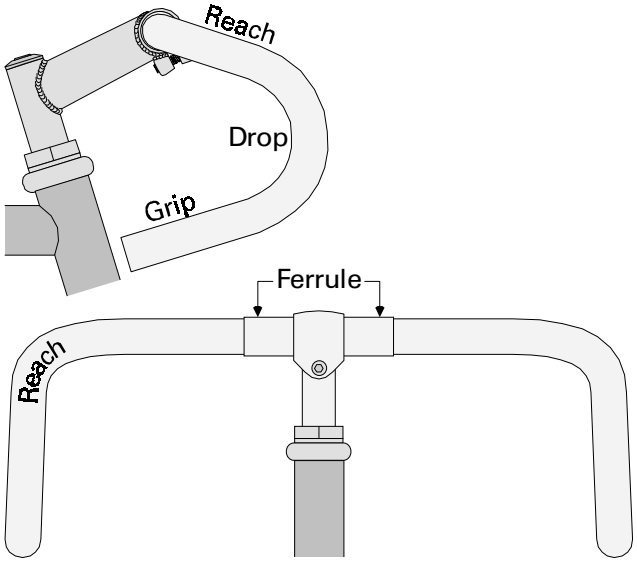
28 – HANDLEBARS, STEMS, AND HANDLEBAR EXTENSIONS

ABOUT THIS CHAPTER

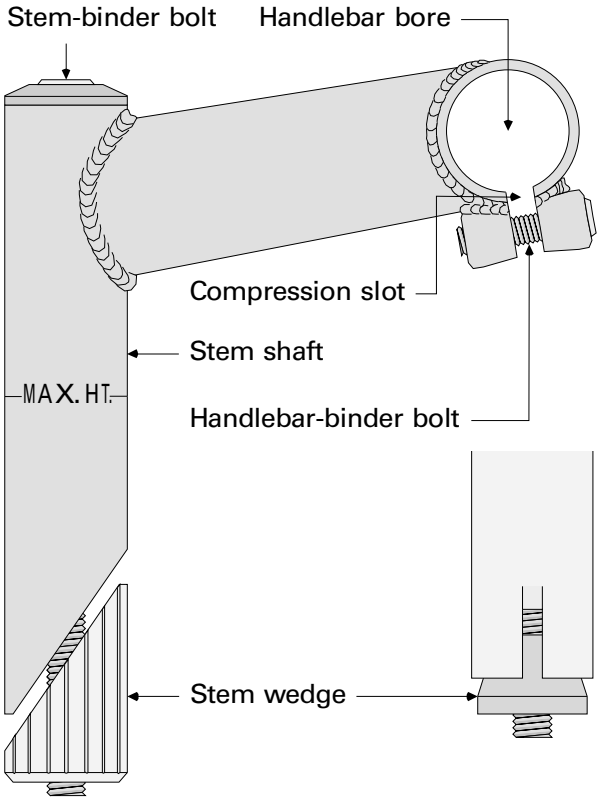
This chapter is about stems, handlebars, handlebar extensions and clip-ons, and handlebar coverings. With regard to stems, it covers removing stems from the bike, fitting stems to the bike, installing and aligning the stem, and problems with stems. With regard to handlebars, it covers removing handlebars from the stem, fitting handlebars to the stem, installing and aligning the handlebars, and problems with handlebars. With regard to handlebar extensions and clip-ons installation, alignment and security are covered. Each of these subjects simultaneously addresses road and off-road varieties. With regard to handlebar coverings, there are instructions for installing and removing off-road handlebar grips and road-bike handlebar tape.

Supplemental information about BMX/Freestyle bars and stems and upright (touring and cruiser) styles is also included. There are no specific procedures included for these types.

One type of stem is not covered in this chapter. Bikes with a threaded fork column have a headset that threads onto the fork column and a stem inserts inside the fork column. Bikes with a threadless fork column have a headset that slides onto the fork column, and a stem that clamps onto the fork column where it extends above the headset. Because the stem in this system functions as a lock for the headset adjustment, it is covered in the **HEADSET** chapter in the section on threadless headsets (page 11-21).



28.1 *Parts of a drop bar.*



28.2 *Parts of a stem*

GENERAL INFORMATION

TERMINOLOGY

Handlebar: The tube that is gripped in the hands, and to which the brake levers and shift levers are usually mounted.

Bar: Short for *handlebar*.

Drop bar: The traditional road-bike handlebar that goes out from the stem, hooks forward, than curves down and back (the drop).

Bar center: The usually bulged or sleeve-reinforced center of the handlebar.

Handlebar ferrule: A reinforcing sleeve on a handlebar where the bar goes through the stem.

Stem: The component that connects the handlebar to the fork. It has also been called a "gooseneck," or "neck."

Stem shaft: The vertical shaft of the stem that inserts in the fork.

Stem rise: The vertical height of the stem.

Stem extension: The horizontal length of the stem.

Handlebar bore: The hole through the stem that the handlebar goes into.

Handlebar-binder bolt: The bolt that compresses the handlebar bore to secure the handlebar in the stem.

Compression slot: The slot in the handlebar bore that is compressed when the handlebar-binder bolt is tightened, causing the inside of the handlebar bore to compress on the handlebar. There is also a compression slot in the fork column bore of some stems that are used in threadless headsets (see page 11-21).

Stem-binder bolt: The vertical bolt that goes through the stem shaft that is used to secure the stem in the fork.

Stem wedge: The wedge piece below the stem shaft that secures the stem in the fork column when the stem bolt draws the wedge up. The wedge is usually a cylinder with a sloped end that slides across a corresponding slope on the bottom of the stem shaft. As the sloped wedge is drawn up, it displaces the bottom of the stem shaft laterally, causing it to bind against the inside of the fork column. Occasionally the wedge is a conical shape that slides up into a conical hole in the bottom of the stem, causing the split stem shaft to expand. (See figure 28.2, page 28-1.)

Handlebar extension: The forward extension that can be mounted on the outward end of an off-road handlebar.

Handlebar clip-on: A forward extension of the handlebar that can be mounted to a drop bar to enable the rider to ride in a more aerodynamic position.

Handlebar grips: The rubber or plastic sheaths that cover the end of an off-road bar where the bar is grasped. Also called "grips."

PREREQUISITES

In certain instances, it is necessary to disconnect the brake-control wires and/or the shift-control wires in order to remove and replace a handlebar or stem. If this is the case, it will be necessary to adjust the derailleurs and/or brakes.

If changing stem length or bar size, it is possible that all the control cables will need to be re-sized. Once again, it will be necessary to adjust derailleurs and/or brakes.

INDICATIONS

The primary reasons to change the bar or stem is to upgrade quality or change the way the customer fits the bike. Bent MTB bars are somewhat common, as well. A stem would be also taken out to service the headset or replace a fork.

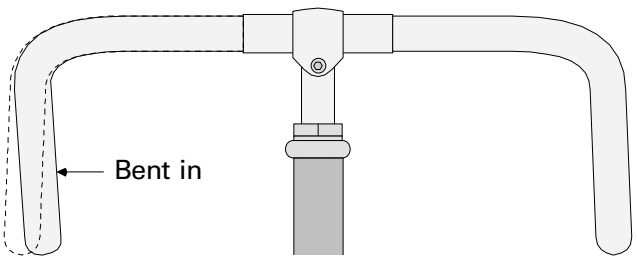
Maintenance cycles

Although stems and bars do not have moving parts, maintenance is very important. The stem runs the risk of becoming a permanent installation if the bike is exposed to a wet or humid environment, or if the customer rides a lot indoors and sweats on the stem. At least once every six months (and as often as monthly if conditions dictate it), the stem should be removed from the bike and the stem shaft, head of the stem bolt, stem-bolt threads, and stem wedge should be liberally greased. Bars need monthly inspections for fatigue bends and fatigue cracks. Handlebars should also be closely inspected for bends and cracks after every crash.

Symptoms indicating bars should be replaced

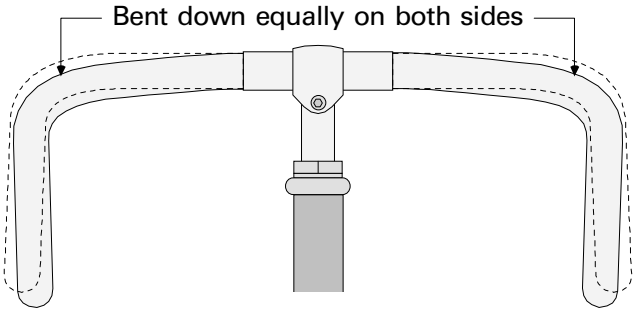
Handlebars need to replaced when they crack. Bent handlebars are bars in the process of cracking, so all bent handlebars should be replaced immediately. Regular inspections of handlebars for cracks is very important. The most likely place for a crack to appear is on top of the bar and just outward of the stem. Other places to check for cracks on off-road bars is on either side of the brake-lever clamp and just inward of any handlebar-extension clamp.

Inspect for bent handlebars after any crash. With someone holding the bike straight up and the front wheel straight, crouch down in front of the bike and look straight at the handlebars. If the two sides are not symmetrical then the bars are bent.

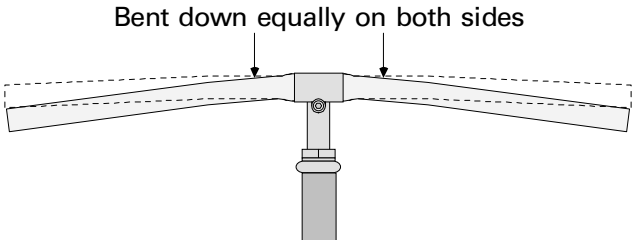


28.3 *Crash-bent bars.*

Bars bend from fatigue as well as from crashing. This is particularly true of extra-light-weight off-road bars. When bars bend from fatigue, they will appear symmetrical, but when viewed from in front it will be apparent that they begin to drop down immediately from the point that they come out of the stem. When drop bars bend from fatigue, they exhibit this same symptom, and the drops move closer together, as well. For example, a drop bar that originally measured 40cm from center of one bar end to center of the other bar end might measure as little as 36cm.



28.4 *Fatigue-bent drop bars*



28.5 *Fatigue-bent MTB bars.*

Symptoms indicating bars should be secured

Handlebars can exhibit two symptoms when they are loose and need to be secured. They may make creaking sounds or they may slip.

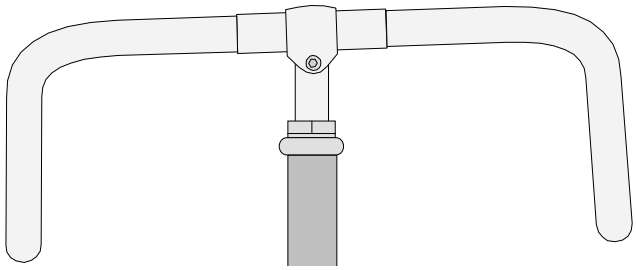
Creaking sounds can be caused by other things, but nothing is more important than loose handlebars so always treat this symptom as reason to check the bar security.

Slipping can be sudden and dramatic, in which case there will be no wondering whether the bars need to be secured, or it can be gradual and subtle. On road bikes with drop bars, it might be noticed that the brake levers seem lower, or that when riding on the drops it feels different. When installing bars, it is a good idea to note the angle of the bottom portion of the bar, and inspect after the first few rides to see if it remains the same. It is normal for the bottom of a drop bar to point down to the back or be flat. Anytime the bottom of the drop bar is pointing up to the back, check if the handlebars are loose.

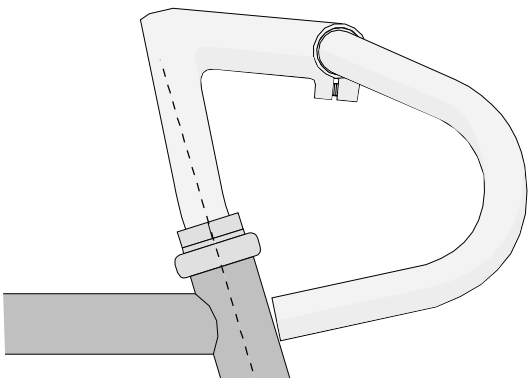
Off-road bars experience less leverage than drop bars, unless they have bar extensions or have a forward bend. Once again, note the angle of any built-in or bolt-on forward extension when the bar or extension is first installed. Check this angle after a few rides to see if it has changed. If both bolt-on extensions change the same amount, then the bar is probably slipping. If one changes more than the other, then either the bar or the extension(s) could be slipping.

Symptoms indicating stem should be replaced

Stems can bend in a crash or may bend or crack from fatigue. If they bend from a crash, the bars may also be bent and the damage to the stem may not become obvious until after replacing the bent bar. If the bars are in good condition but one side is lower than the other, then the stem is bent. Stems that bend from fatigue are rare, but what happens in these cases is that the stem shaft makes a forward bend where it comes out of the headset. Stems that crack from fatigue will have cracks in numerous locations. The cracks may appear around the handlebar-binder bolt, where the extension joins the handlebar clamp, where the stem shaft and forward extension join, or in the stem shaft in the portion below the top of the headset.



28.6 *If these bars are straight, then the stem is bent from a crash.*



28.7 *This stem is bent forward from fatigue.*

Symptoms indicating stem should be secured

The symptom indicating that the stem is loose could be creaking or slipping. Creaking is more likely. Creaking can be caused by other things, so if securing the stem does not solve the problem be sure to check handlebar security. Creaking can also be caused by the fit of headset pressed races to the head tube and by a looseness between the bar center ferrule and the bar. A loose stem will slip by rotating, not by sliding down. Rotation that happens when a crash occurs does not indicate that the stem is too loose. In fact, it is desirable that the stem rotate to prevent damage to the bars. A stem that rotates when riding is one that is too loose.

Headset overhaul and replacement

Stem removal is required for headset overhaul or replacement.

Fork replacement

Stem removal is required for fork replacement.

TOOL CHOICES

There are no special tools required for stem and bar service. There is one optional type of tool, used for cleaning out a fork after removing a stuck stem. This is either a Flex-hone BC27 (1" fork columns), BC29 (1–1/8" fork columns), or BC35 (1–1/4" fork columns). These tools are installed on a drill and spin at high speed inside the fork column to clean out rust.

TIME AND DIFFICULTY

Removing and installing a *stem and bar set* is a job of little difficulty that takes 2–4 minutes. If the stem is corroded in place, it can become a job of high difficulty.

Replacing a *stem* is a job of little difficulty in itself, but to the extent that it requires disconnection of brake or derailleur cables, it can become a job of moderate to high difficulty.

Replacing a *handlebar* is a job of little difficulty in itself, taking only 5–10 minutes, but to the extent that it requires disconnection of brake or derailleur cables, it can become a job of moderate to high difficulty. If the stem is corroded in place and must be removed to access the bars, it can become a job of high difficulty.

COMPLICATIONS

Wedge will not go down after loosening stem-binder bolt

It is normal to have to strike the top of the handlebar-binder bolt after loosening, to get the wedge to drop. When this does not work, it means that the wedge is badly corroded in place. See step #6, page 28-6.

Stem will not remove once wedge has dropped

It is natural to assume that this is caused by corrosion, but it could be as simple as binding caused by an off-center hole in a headset locknut. Try loosening the locknut before preparing to work on a corroded stem.

Stem will not install even if it is the correct size

This could be caused by corrosion, in which case the inside of the fork should be honed. It could also be caused by an under-sized or off-center headset-locknut hole. Check the installation with the locknut loosened or removed.

Handlebars slip when properly torqued

This is caused by poor bar-to-stem fit, or contamination on the mating surfaces. The complication comes when it occurs during a assembly of a bicycle that came with a fully assembled and taped bar set, which must be stripped on one half to clean the mating surfaces or measure to check fit.

Extensions slip when properly torqued

Handlebar extensions are prone to slipping due to contamination on the mating surfaces, poor fit, or painted or anodized mating surfaces. Check fit, clean mating surfaces, and sand mating surfaces to expose raw aluminum.

Control cables end up too short after installing wider bars or a longer stem

This one should be caught before the job is ever started. Nothing can be done but install new cables and adjust any brakes or derailleurs affected.

Cables will not allow stem to lift far enough to remove from fork

Sometimes a cable will interfere with removal of a stem. Cables routed under the handlebar tape to a front sidepull brake often cause this problem. It is usually easiest to remove the caliper from the fork. It all other cases, try to operate the mechanism in a way that will cause the inner wire to slacken and then slip a housing end out of any split housing stop.

ABOUT THE REST OF THIS CHAPTER

The rest of this chapter is in six sections. The first is ***STEM REMOVAL, REPLACEMENT, AND INSTALLATION***. It is followed by ***HANDLEBAR REMOVAL, REPLACEMENT, AND INSTALLATION***. This is followed by ***INSTALLING HANDLEBAR CLIP-ONS AND EXTENSIONS*** . Next there is a brief section on ***HANDLEBAR-COVERING REMOVAL AND INSTALLATION***. Following this is a section, ***OTHER BAR SYSTEMS***, regarding BMX and upright (touring and cruiser) systems. The last part is ***HANDLEBAR AND STEM TROUBLESHOOTING***. Depending on what operation is being done, use any section by itself, or it may be best to include parts (or all) of various sections to complete the task.

STEM REMOVAL, REPLACEMENT, AND INSTALLATION

STEM REMOVAL

When removing the stem from the fork, any derailleur- and/or brake-control cables can interfere with being able to pull the stem out of the fork column. Furthermore, any of these cables are more prone to damage if left attached to the bar set and they end up supporting the weight of the bar set. How these control cables can be disengaged is highly variable depending on the type of equipment. The following are guidelines that will apply often, but not always.

Mountain-bike brake levers: Usually brake cables can be released from the brake levers and reconnected in a way that will not require any adjustment. Unhook the lead-beaded end of the straddle wire from one of the caliper arms. On the brake lever, line up the slots in the cable adjusting barrel, adjusting barrel locknut, and bottom of the body of the lever. Pull the housing and end cap straight out the end of the adjusting-barrel socket and then swing the inner wire down through all the lined-up slots. If necessary, compress the lever to the grip and then slip the head of the inner wire out the back face (usually) of the lever.

Cables to front cantilever brakes when the cable is routed through the stem: Unhook the lead-beaded end of the straddle wire from one of the caliper arms. The straddle wire may be connected to the primary brake wire by a roughly triangular device called a cable carrier. If this is the case, the straddle wire is usually resting in an open cradle in the back of the cable carrier. By deflecting the loose end of the primary wire, the straddle wire can be lifted out of the cradle. If the cable carrier is a circular disc and there is no open cradle, then unhooking the wire from the cable carrier will require full re-adjustment of the brake. It would be easier to just unmount the caliper arm (that still has the cable attached to it) from the frame by loosening the bolt that goes through the caliper arm and into the fork. Be familiar with mounting cantilever arms before deciding to remove one.

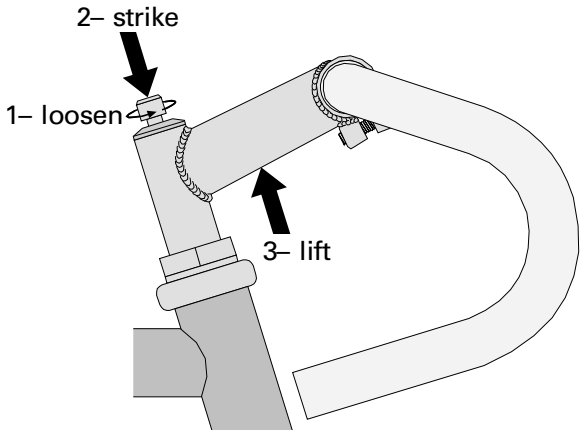
Non-aero' road-bike brake levers: If the brake cables are free loops of housing that come down into the top of the brake levers on drop bars, they can usually be released from the brake levers in a way that re-adjustment will not be required. Release any quick-release mechanisms on both brakes. Remove both wheels from the bike. Using a third-hand tool, squeeze a caliper so that the brake pads meet. Squeeze the brake lever in just enough so that the point that the cable head hooks into the anchor (inside the lever) can seen. If there is a slot in the anchor, then push enough slack cable into the lever so that the cable head drops below the anchor, push the cable out the slot in the anchor, then pull the cable out of the lever and lever body.

Aero' road-bike brake levers: Only the front cable can be freed without requiring re-adjustment of the brake. In many cases, this will be all that is needed to get the stem out of the fork column or to replace the stem. Simply unbolt the brake caliper from the fork. There will be a 10mm hex nut or 5mm Allen nut on the back of the fork crown for this purpose. The only brake adjustment needed will be centering the pad clearance.

Mountain-bike shift levers: All cables are attached to the shift levers in a way that the cable cannot be released from the lever without having to adjust the cable after re-installation. However, it is sometimes possible to release the lever from the handlebar without having to re-adjust the cables/derailleurs. If the shift-control mechanism is a separate unit from the brake lever and has a thin steel strap that wraps around the handlebar, then a binding bolt can be removed and the strap can be spread to allow removal of the entire lever unit from the handlebar. If the lever is a separate unit and has a thick cast aluminum body that wraps around the lever, it may be possible to remove the shifting unit from the mounting body. Look for a 5mm or 6mm Allen bolt on the backside from the lever face.

Before removing the stem, confirm that the stem is conventional, and not a stem that clamps on the outside of an unthreaded fork column (AheadSet or other threadless headset). Conventional stems have an Allen bolt that goes down through the stem shaft. The only other bolt in the stem is at the handlebars to secure the bars in the stem. The other type of stem has an Allen bolt in the same location, but has one or two other bolts on the backside or just in front of the "stem shaft." If the stem is this type, then the bike has an threadless-type headset bearing, and the stem is actually part of the headset. To perform stem removal in this case, see the **HEADSET** chapter in the section for threadless headsets (page 11-21).

1. **[ ] Release any cables from control levers or levers from handlebars that will facilitate bar removal.**
2. **[ ] Turn the Allen bolt that goes down through stem shaft 4–6 full turns counterclockwise.**
3. **[ ] If bolt head rises up, strike bolt head sharply with plastic mallet to force stem wedge down. (If it will not drop, then try ball peen.)**



28.8 *Loosening the stem.*

4. **[ ] When loosened bolt head has dropped to (or remained at) its original position, pull up with gently twisting motion to lift stem shaft out of fork column.**
5. **[ ] If any remaining cables resist stem's range of motion so that it will not lift clear of fork column, detach cables from brake or derailleur (derailleur or brake adjustment will be required) and then remove stem.**
6. ***If stem is difficult to remove*:**
   [ ] Loosen headset locknut fully and slide it up stem shaft (headset adjustment will be required later).
   [ ] Drip light oil or penetrating oil in crack between stem shaft and fork column.
   [ ] Turn bike over and flood bottom of stem (through hole in bottom of fork crown) with light oil or penetrating oil.
   [ ] Pull up while twisting vigorously on stem until is has moved, then stop and wait 15 minutes.
   [ ] After waiting 15 minutes for stem to cool, repeat oiling, pulling and twisting, and another waiting period.
   [ ] If after stem is removed if corrosion is evident, use Flex-hone or emery cloth to clean inside of fork column and emery cloth to clean stem shaft.
7. ***If stem will not rotate in fork column or lift at all after performing step 6*:**
   [ ] Clamp fork crown in bench vise (protecting crown with blocks of wood).
   [ ] Use oiling, twisting, pulling and waiting techniques describe in step 6.
   [ ] After stem is removed, if corrosion is evident use Flex-hone or emery cloth to clean inside of fork column and emery cloth to clean stem shaft.

If the stem will not remove after trying steps #6 and #7, it must be destroyed to remove it. First, decide whether the fork must be saved. The method of removing the stem to save the fork will take at least one hour. Would it be about as cheap just to replace the fork, also?

To replace the stem and fork, simply remove the stem-binder bolt and use a hacksaw to cut the stem shaft off about 1/2" above the headset locknut. Disassemble the headset and drop the fork out of the head tube.

To save the fork, use a jab saw (special holder for a hacksaw blade) to cut three slots inside the stub of the stem shaft as deep as possible without cutting into the fork-column material. It may be necessary to force the wedge down below the stem-shaft stub. Once the stub of the stem shaft is slotted, use a punch to deflect the three sections inward. Once the stem shaft stub has been collapsed inward, it should be possible to remove it.

STEM REPLACEMENT

When replacing a stem, several factors of fit (both mechanical and biomechanical) should be considered. This book is about mechanics, not riding, so discussions about biomechanical considerations are left out except as how they may affect mechanical ones.

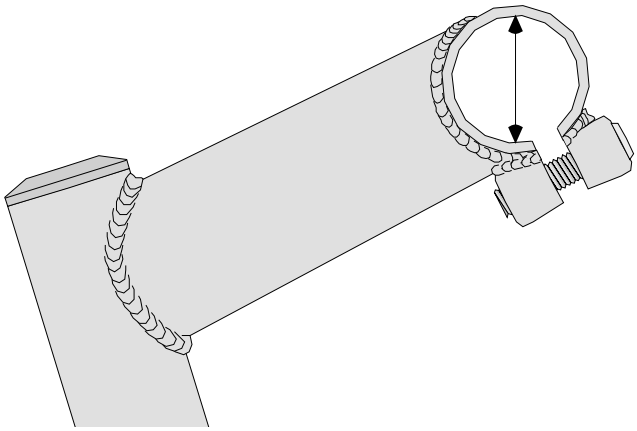
The first mechanical-fit consideration is the fit of the stem to the fork column. Fork columns are made in three sizes today, none of which are close enough together that there should be any confusion about fit. The three sizes are 1", 1–1/8", and 1–1/4". These numbers refer to the outside diameter of the fork column,

which is different from the outside diameter of the stem shaft. The stem diameter that will fit 1" forks is 22.2mm. The stem diameter that will fit 1–1/8" forks is 25.4mm, The stem diameter that will fit 1–1/4" forks is 28.6mm. The best way to determine which is needed is to measure and match the one removed. The next best way is to measure the inside diameter of the fork column, which should be .0 to .1mm larger than the stem diameter.

The second mechanical-fit consideration is the fit of the stem to the bars. In the mountain bike world this is relatively uncomplicated, with almost all handlebars currently being made holding a standard of 25.4mm. Older mountain bikes could be either 26.0mm or 22.2mm, but these are rare now. In the road-bike world, things get more complicated, with several sizes prevailing in the marketplace. These are 25.4mm, 26.0mm, and 26.4mm. The 25.4mm size is most common, with the larger sizes showing up on upscale European bars and some other high-priced brands. Cinelli, Mavic, Modolo, TTT, and Italmanubri are traditional European manufacturers that have used the 26.0mm and 26.4mm dimensions. New U.S. companies are also frequently inclined to use these larger dimensions. Ideally, the bar diameter should be within .2mm of the diameter of the handlebar bore. The difficulty is in measuring the diameter of the handlebar bore, which is not a complete circle and can easily be deformed. The best place to measure the handlebar bore is at the back edge of the compression slot to a point 180° away. Very old European bikes might have a variety of non-standard (and no longer available) bar-center dimensions.

To enhance the fit of the customer's body to the bike, it may be necessary to change the stem to get the bars closer, farther, lower, or higher. Any of these changes affect the length of cable housing for the control levers on the handlebars. If lowering the bars or shortening the stem, the loops could end up too long, which can cause more friction and poorer shift or brake response, or even kinking or failure of the control-cable housing(s). If raising the bars or lengthening the stem, the loops could end up too short, which can cause all the same problems. If making these sort of changes, check the **DERAILLEUR-CABLE SYSTEMS** chapter (page 31-4) and the **BRAKE-CABLE SYSTEMS** chapter (page 35-3) to check on sizing loops of control-cable housing.

8. **[ ] See HANDLEBAR REMOVAL to remove handlebars from stem.**
9. **[ ] Measure old stem-shaft diameter and record here: _____mm.**
10. **[ ] Measure new stem-shaft diameter and record here: _____mm.**
11. **[ ] If measurements in steps 9 and 10 differ by <.2mm, then new stem is comparable fit.**
12. **[ ] Measure old stem handlebar-bore diameter and record here: _____mm.**
13. **[ ] Measure new stem handlebar-bore diameter and record here: _____mm.**



28.9 Measure handlebar-bore diameter here.

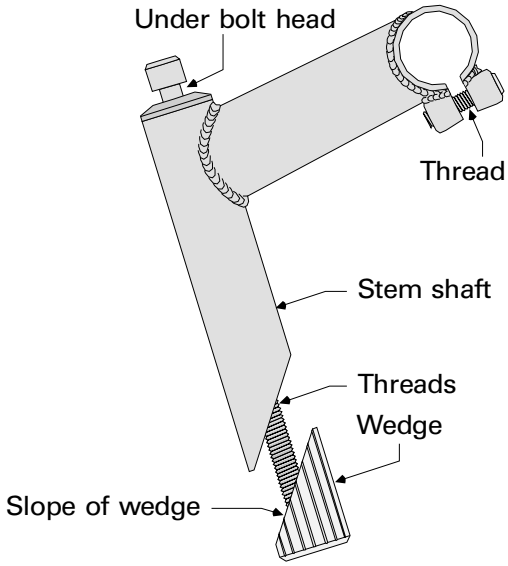
14. **[ ] If measurements in steps 12 and 13 differ by <.2mm, then new stem is comparable fit.**
15. **[ ] Lay new stem on top of old stem so that stem shafts are lined up and maximum-height marks are even and compare locations of both handlebar bores to determine whether new stem will move bars significantly up, down, forward, or back. If so, cable re-sizing may be required.**
16. **[ ] See *HANDLEBAR, REMOVAL, REPLACEMENT, AND INSTALLATION* to install bars in new stem.**

STEM INSTALLATION

Stem installation is a relatively simple procedure, but has dire consequences if done wrong. Failure to lubricate properly can turn the fork and stem into virtually a single piece of metal, requiring replacement of both. Under-tightening the stem can lead to a disastrous loss of control at the most critical time. Over-tightening the stem can lead to a hidden weakening of the fork column, which could break without warning with extremely injurious consequences. Installing the stem too high in the fork can lead to catastrophic fork-column failure.

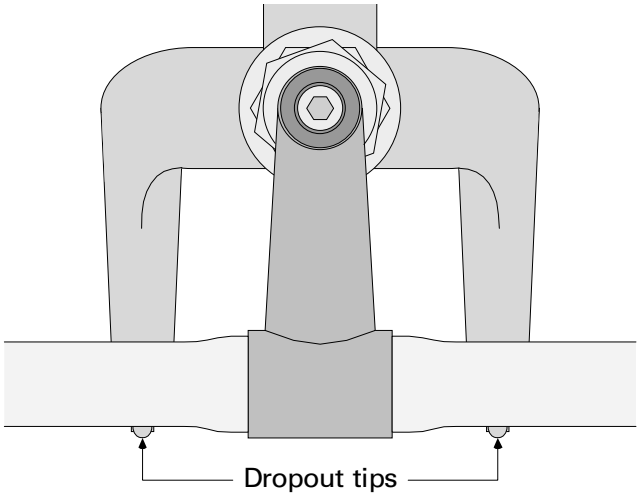
17. **[ ] If handlebars are not installed at this time, see *HANDLEBAR, REMOVAL, REPLACEMENT, AND INSTALLATION* (MTBs, page 28-11 or drop-bars, page 28-9) to install bars to stem.**
18. **[ ] Unthread stem-binder bolt and grease under head of bolt and bolt threads.**

19. [ ] **Grease stem wedge where it contacts stem shaft and inside of fork column.**
20. [ ] **Grease portion of stem shaft that will be inside fork column.**
21. [ ] **Grease inside of fork column to depth stem shaft will be inserted.**



28.10 *Grease points on a stem.*

22. [ ] **Install any washer on stem-binder bolt and install bolt into stem shaft.**
23. [ ] **Engage stem-binder bolt into stem wedge.**
24. [ ] **Locate mark on stem shaft labeled *Maximum Height* or *Minimum Insertion* (either may be abbreviated).**
25. [ ] **Insert stem into fork column *at least* until Max. Ht. or Min. Insert mark is below top of headset.**
26. ***If stem is difficult to install*:**
    [ ] Try loosening stem-binder bolt more and insert again.
    [ ] Check inside of fork column for rubber seal on inner perimeter of headset locknut getting displaced and forced into fork column with stem shaft.
    [ ] Loosen headset locknut and try again (headset will need adjustment).
27. [ ] **Set stem to lower height if desired.**
28. [ ] **Turn bars side-to-side until either bar center appears in line with fork dropouts or front axle (figure 28.11), or stem extension appears in line with front tire.**



28.11 *Align the handlebar center with the tips of the dropouts.*

29. [ ] **Check that Max. Ht./Min. Insert line is still hidden.**
30. [ ] **Secure steel or titanium stem-binder bolt to torque of 145–180in-lbs (24–30lbs@6" or 36–45lbs@4"), or aluminum stem-binder bolt to torque of 145–150in-lbs (24–25lbs@6" or 36–37.5lbs@4").**
31. [ ] **With bike on floor and facing front of bike, grasp front wheel firmly between legs and try to rotate bars side-to-side with about 30-40 pounds of pressure on one end of bars. If bars move with difficulty or don't move at all, stem-binder bolt is adequately secure.**

HANDLEBAR REMOVAL, REPLACEMENT, AND INSTALLATION

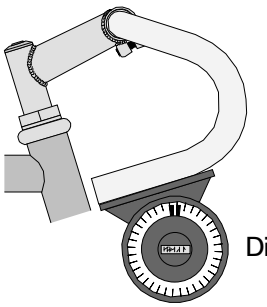
NOTE: Skip to step 9 if removing off-road bars.

DROP-BAR-HANDLEBAR REMOVAL

Drop handlebars must be rotated wildly to snake them through the handlebar bore of the stem, and often end up interfering with another part of the bike if the stem is in the bike when the bars are being removed, so stem removal should generally be done first.

Bars may be removed to replace a stem, in which case only one side of the bars needs to be stripped, or bars may be removed in order to replace the bars, in which case both sides will need to be stripped. This section strips only one side, then in the section of the worksheet for bar replacement the other side is stripped of handlebar coverings and control levers.

1. [ ] Remove handlebar tape or handlebar covering from one side of bar.
2. [ ] Unhook or detach control cables from control levers on both sides.
3. [ ] Measure angle of bars with angle finder, if customer position will be restored. Record angle here: _____



28.12 *Measuring drop-bar position.*

4. [ ] Note position of control levers (so position can be restored if desired) and remove control levers from one side of bars (see brake and derailleur chapters).
5. [ ] Remove stem (see ***STEM REMOVAL, REPLACEMENT, AND INSTALLATION***, page 28-5).
6. [ ] Loosen handlebar-binder bolt.
7. [ ] Slide stem off fat center section of bar to the side where covering and controls were removed.

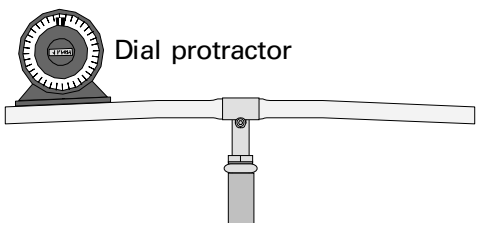
It can be tricky getting the stem past the bends in the bars. Look closely at the handlebar bore in the stem to see that at one point it is narrower than elsewhere. Keep this narrow side of the bore to the inside of each bend in the bar, then it will be unlikely the stem will jam as it is removed.

8. [ ] Rotating stem about bar to keep narrowest part of handlebar bore at inside of each bend of bar, slip stem off of bar.

Note: Skip steps 9–12 if drop bars already removed.

OFF-ROAD-HANDLEBAR REMOVAL

9. [ ] Remove grip from one end of handlebar, then measure bar angle with angle finder and record here: _____



28.13 *Measuring off-road bar position.*

10. [ ] Unhook or detach control cables from control levers on both sides.

NOTE: If replacing stem only, see* STEM REMOVAL, REPLACEMENT, AND INSTALLATION *to remove stem.

11. [ ] Loosen handlebar-binder bolt(s).

Now that the handlebar-binder bolt has been loosened, the bars should just slip out of the stem. In many cases, it is not this easy. In order to get the bars out of the stem, the stem bore needs to be expanded. When the bars will not slip out, first remove the handlebar-binder bolt completely. Use something like a fat screwdriver to pry open the compression slot, and then slide the bars out.

12. [ ] Slide handlebar out of stem.

HANDLEBAR REPLACEMENT

13. [ ] Remove handlebar covering and control levers from second side of bar.
14. [ ] Measure handlebar-bore diameter in stem and record here: _____mm.
15. [ ] Measure handlebar-center diameter of new bars and record here: _____mm.
16. If step 14 is .0 to .2mm more than step 15, bar and stem are good fit. If different by more, test for good fit. Check one of following choices.
    [ ] Fit is good.
    [ ] Need to test fit.

DROP-HANDLEBAR INSTALLATION

NOTE: If installing off-road bars, skip to step 28.

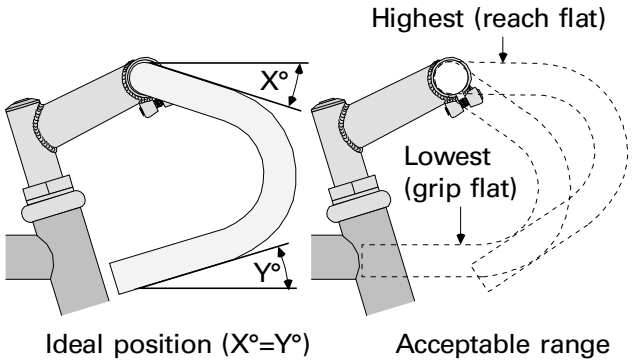
17. [ ] Remove handlebar-binder bolt(s) from stem.
18. [ ] Use caliper to measure diameter of handlebar-binder-bolt thread and record here: _____mm.
19. [ ] Grease threads and under head of handlebar-binder bolt(s).

NOTE: If positioning and securing already installed drop bars, skip to step 22.

20. [ ] Use alcohol or acetone to clean inside of handlebar bore in stem and center section of handlebar.
21. [ ] Insert handlebar into stem, rotating stem around bar to keep narrowest part of handlebar bore always at inside of bar bends, and center bar in stem.
22. [ ] Install and gently snug handlebar-binder bolt(s).

The rotation of the handlebars is strictly a matter of personal preference, but it is likely that the customer has simply been living with whatever position the shop set them up at. If the customer would like to try the bars in a different position, consider these guidelines. If the top extension of the bar is parallel to the ground, it favors riding primarily on the tops of the bars, and handicaps access to the brake levers when riding in the

drops. If the bottom grip of the bar is parallel to the ground, it favors riding primarily in the drops, and handicaps access to the brake levers when riding on the tops of the bars. Usually the best position is a compromise between these extremes, with the top extensions of the bars sloping slightly down toward the brake levers, and the grips sloping slightly down toward the back of the bike. This position is recommended if setting up new bikes, without a customer preference indicated. For the ideal neutral position, the angle of the reach should equal the angle of the grip.



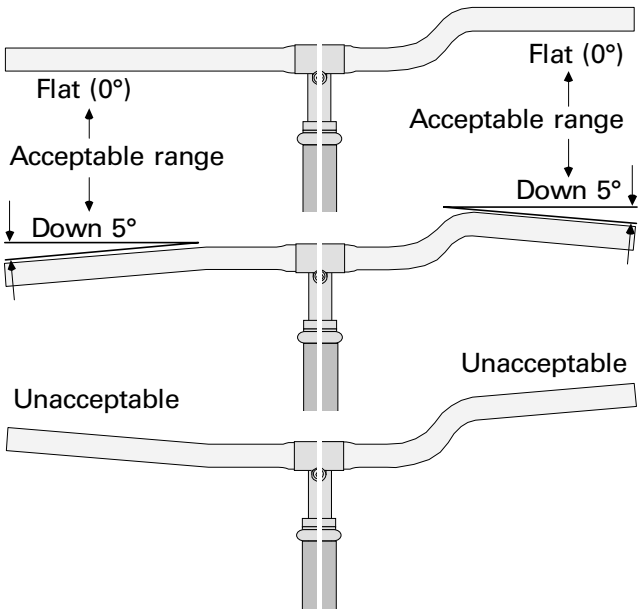
28.14 *Acceptable range of drop handlebar rotations.*

23. [ ] Rotate bar to desired position.
24. Transfer measurement in step 18 to here (_____mm) and torque handlebar-binder bolts to one of following torque ranges depending on handlebar-binder-bolt-thread diameter:
[ ] Torque bolts w/ thread diameter ≤6mm to 120–145in-lbs (20–24lbs@6" or 30–36lbs@4").
[ ] Torque bolts w/ thread diameter >6mm to 205–240in-lbs (34–40lbs@6" or 51–60lbs@4").
25. [ ] Install control levers per SHIFT-CONTROL MECHANISMS (page 30-10 or 30-15) and/or BRAKE LEVERS (page 34-6) chapter instructions.
26. If *Need to test fit* option is checked in step 16, perform following security test:
[ ] With bike on floor, stand facing bike and straddle front wheel.
[ ] Grasp brake-lever bodies in similar fashion to when riding with weight supported at brake levers, and support full weight on brake levers until feet lift off floor.
[ ] Check if bar position has changed.
[ ] If bars slip and handlebar-binder bolts are not torqued to maximum recommendation, add torque and test again.
[ ] If bars slip at maximum torque, fit is bad. Change bar or stem to improve fit.
27. [ ] Attach control cables to derailleur and/or brake levers and adjust derailleurs and/or brakes as per instructions in derailleur and/or brake chapters.

OFF-ROAD-HANDLEBAR INSTALLATION

28. [ ] Remove handlebar-binder bolt(s) from stem.
29. [ ] Use caliper to measure diameter of handlebar-binder-bolt thread and record here: _____mm.
30. [ ] Grease threads and under head of handlebar-binder bolt(s).
NOTE: If positioning and securing already-installed off-road bars, skip to step 33.
31. [ ] Use alcohol or acetone to clean inside of handlebar bore in stem and center section of handlebar.
32. [ ] Insert handlebar into stem & center bar in stem.
33. [ ] Install and gently snug handlebar-binder bolt(s).

The rotation of the handlebars is strictly a matter of personal preference, but it is likely that the customer has simply been living with whatever position the shop set them up at. If the customer would like to try the bars in a different position, consider these guidelines. If the grips of the bars slope up to the outside, it tends to put the elbows in an inflexible position, which reduces comfort and control. If the grips are flat or slope down to the outside no more than five° (about 3/4" drop over the length of the grip), the elbows are relaxed. If the grips slope down too much, then the hand will tend to slip off the end of the grip. Somewhere between flat and 5° down is recommended if setting up new bikes, without a customer preference indicated.



28.15 *Acceptable range of MTB-bar rotation.*

34. [ ] Rotate bar to desired position.

35. **Transfer measurement in step 29 to here (_____mm) and torque handlebar-binder bolts to one of following torque ranges depending on handlebar-binder-bolt thread diameter:**
    [ ] Torque bolts w/ thread diameter ≤6mm to 120–145in-lbs (20–24lbs@6" or 30–36lbs@4").
    [ ] Torque bolts w/ thread diameter >6mm to 205–240in-lbs (34–40lbs@6" or 51–60lbs@4").
36. **[ ] Install control levers per SHIFT CONTROL MECHANISMS (page 30-3 or 30-8) and/or BRAKE LEVERS (page 34-5) chapter instructions.**
37. **If *Need to test fit* option is checked in step 16, perform following security test if handlebar extensions are being used:**
    [ ] With bike on floor, stand facing bike and straddle front wheel.
    [ ] Grasp handlebar extensions and support full weight on extensions until feet lift off floor.
    [ ] Check if bar position has changed, or if handlebar extensions have slipped.
    [ ] If bars slip and handlebar-binder bolts are not torqued to maximum recommendation, add torque and test again.
    [ ] If bars slip at maximum torque, fit is bad. Change bar or stem.
38. **[ ] Attach control cables to derailleur and/or brake levers and adjust derailleurs and/or brakes as per instructions in derailleur and/or brake chapters.**

INSTALLING HANDLEBAR CLIP-ONS AND EXTENSIONS

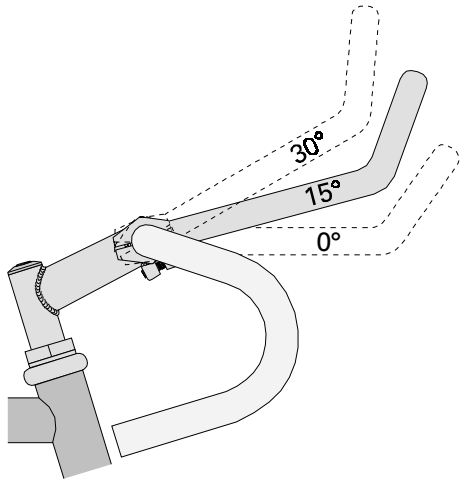
DROP-BAR CLIP-ONS

NOTE: Skip to step 8 if installing extensions on an off-road bike.

Aerodynamic clip-on extensions for drop handlebars may be great for improved perfomance or comfort riding, but mechanically they are a nightmare. Manufacturers make the clamps for clip-on bars in two configurations, V-block and radius clamp. The V-block system has the advantage of fitting any diameter handlebar, but slips easily and damages bars easily if tightened enough to avoid slippage. The radius-clamp type is a more secure grip, but only if it matches the diameter of the bar closely. Either type is adequate to secure if the rider *always* rides in the intended fashion with the bulk of load on the elbow pads. In an emergency, or with poor riding habits, the load may end up at the outer end of the clip-on, which is when the clamps may slip. Even if the clamps do not slip, the handlebar may be subjected to more rotational load than the stem clamp is designed to withstand, resulting in the bars slipping in the stem.

To reduce problems with clip-ons, follow these several rules: 1) recommend that the customer always use them as they are intended and do not rest weight out at the end of the clip-ons; 2) always clamp them directly to the bar, and not on top on any handlebar covering; 3) always clean the mating surfaces of the clamps and the bar thoroughly, including removing epoxy, paint, or anodized finishes with emery cloth; 4) lubricate bolts properly and follow torque recommendations closely; 5) inspect bars for fatigue cracks regularly where clip-on clamps engage bars.

1. **[ ] Remove handlebar tape or handlebar covering from portion of the bar where clamp secures.**
2. **[ ] Remove anodization finishes, paints, or epoxy coats from inside of clamp and outside of bar where clamps engage.**
3. **[ ] Clean mating surfaces with alcohol/acetone.**
4. **[ ] Remove clamp bolts, measure thread diameter, and record here: _____mm.**
5. **[ ] Thoroughly grease bolt threads and under bolt heads.**
6. **[ ] Mount clip-ons, install bolts, and gently secure.**
7. **[ ] Position clip-ons at desired angle.**



28.16 *Normal range of clip-on positions.*

8. **Torque bolts to following torque ranges depending on thread diameter:**
   [ ] ≤5mm, torque to 50in-lbs (8lbs@6" or 12.5lbs@4").
   [ ] 5.1–6mm, torque to 120–145in-lbs (20–24lbs@6" or 30–36lbs@4").
   [ ] 7–8mm, torque to 155–205in-lbs (26–34lbs@6" or 39–51lbs@4").

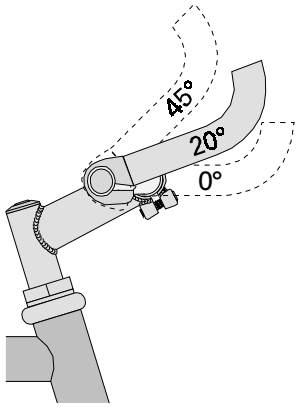
OFF-ROAD-HANDLEBAR EXTENSIONS

Off-road-handlebar extensions may be great for improved perfomance or comfort riding, but mechanically they are a nightmare. Manufacturers make the clamps for clip-on bars in two configurations, external and internal clamping. The external system has the advantage of fitting any handlebar equally well, but the clamp is bulkier and requires that the grips and controls be moved inward. The internal-clamp type doesn't require moving grips and controls, and the clamp is less bulky, but will be secure only if it matches the inside diameter of the bar closely (there are no standards for inside bar-diameter). Provided that an internal-clamp extension is a good fit, either clamp type will adequately secure the extension, if the rider *always* rides in the intended fashion, which is using extensions when climbing or high-speed cruising on smooth terrain. In an emergency, or with poor riding habits, the load may end up on the extensions when the customer hits a bump, which is when the clamps may slip. Even if the clamps do not slip, the handlebar may be subjected to more rotational load than the stem clamp is designed to withstand, resulting in the bars slipping in the stem.

Extra-light-weight bars create another problem. The external extension clamp can crush the bar due to the thin wall. Inserts are made to reinforce the bar. The insert should match the bar I.D. closely and be at least as wide as the extension clamp.

To reduce problems with handlebar extensions, follow these several rules: 1) recommend that the customer always use them as they are intended and do not rest weight on them when traveling on rough terrain; 2) always clean the mating surfaces of the clamps and the bar thoroughly, including removing epoxy, paint, or anodized finishes with emery cloth; 3) lubricate bolts properly and follow torque recommendations closely; 4) inspect bars for fatigue cracks regularly where clamps engage bars.

1. [ ] **If installing external-clamp handlebar extension, move controls and grips inward enough to provide room for full engagement of clamp to bar.**
2. [ ] **Rremove paint, epoxy coats, or anodization finishes from inside of clamps and outside of bar where clamps will engage.**
3. [ ] **Clean mating surfaces with alcohol/acetone.**
4. [ ] **Thoroughly grease bolt threads and under bolt heads.**
5. [ ] **Mount extensions, install bolts, and gently secure.**
6. [ ] **Position extensions at desired angle.**



28.17 *Normal range of extension positions.*

7. [ ] **Torque bolts to 120–145in-lbs (20–24lbs@6" or 30–36lbs@4").**

HANDLEBAR-COVERING REMOVAL AND INSTALLATION

OFF-ROAD GRIPS

Steps #1–5 are 100% reliable and safe. Filling the bars with compressed air to remove grips works in some cases, but not if grips are torn on the end or made of certain foams. Cutting the grips off with a sharp knife always works if the grips will not be re-used, but the following procedure has no risk of self-injury.

Removal

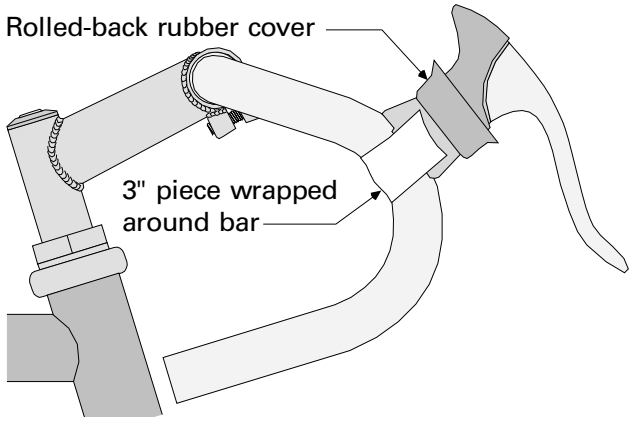
1. [ ] **Insert long skinny screwdriver between grip and bar to create gap between grip and bar.**
2. [ ] **Spray or drip water between grip and bar then remove screwdriver.**
3. [ ] **Insert screwdriver between grip and bar at a 180° opposite original insertion.**
4. [ ] **Spray or drip water between grip and bar then remove screwdriver.**
5. [ ] **Twist grip back and forth to spread water around, then pull grip off.**

Installation

1. [ ] **Clean bar of any contamination with alcohol.**
2. [ ] **Spray inside of grip with hair spray and slip grip onto handlebar quickly.**
3. [ ] **Allow several hours for hair spray to set before riding, check grip security before riding.**

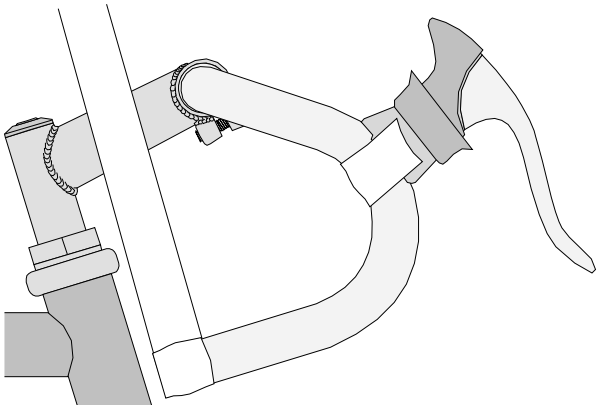
DROP-BAR TAPING

1. [ ] **Remove old tape unless fatter bar diameter is preferred.**
2. [ ] **Roll back rubber cover on brake lever to expose base of brake-lever body.**
3. [ ] **Unless provided, cut 3" piece from end of tape and cover brake-lever mounting strap, so that both ends of piece will end up under rubber cover when rubber cover is down.**



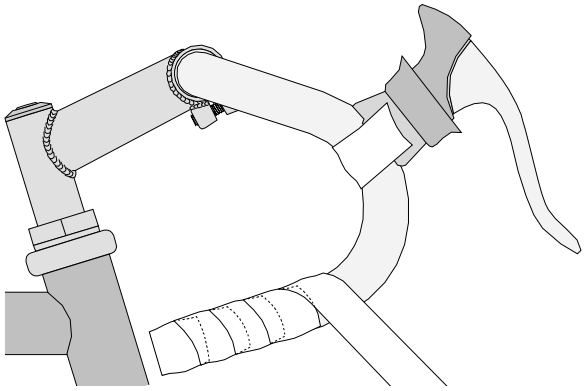
28.18 *Put a 3" piece of tape over the brake lever mounting strap.*

4. **Check fit of handlebar plug or cap to end of bar and check one of following options:**
   [ ] No handlebar plug will be used, handlebar-end shifters are mounted in bars, first wrap of tape will start flush with end of bar.
   [ ] Handlebar plug is snug fit to bar, first wrap of tape will start flush with end of bar.
   [ ] Handlebar plug is loose in bar, first wrap of tape needs to overlap end of bar by 10–15mm.
5. [ ] **Start tape at bottom of bar, with end of tape on top of bar and pointing in, with edge of tape flush to or overlapping bar as determined in step 4.**



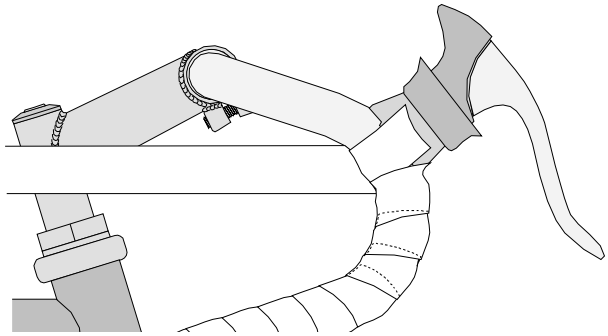
28.19 *Start with a full wrap with no advance.*

6. [ ] **Complete one wrap of tape without advancing it so that end of tape is hidden by wrap.**
7. [ ] **Pulling with a gentle-to-firm pressure, continue wrapping around bar, advancing tape with each wrap so that each wrap overlaps the last by about 1/3 the tape width until first bend of bar is reached.**



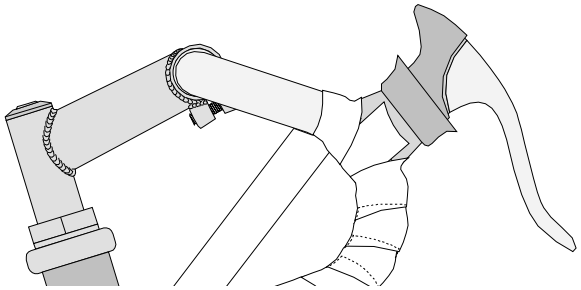
28.20 *Overlap each wrap by 1/3 the width of the tape.*

8. [ ] **Continue advancing up bend of bar, maintaining 1/4 – 1/3 of tape width overlap *at outside of bar bend.***



28.21 *Overlap each wrap by 1/4 – 1/3 the width of the tape on the outside of the bend of the bar.*

9. [ ] **Adjust amount each wrap overlaps last wrap so that when tape reaches bottom of brake lever, it overlaps bottom edge of lever body by 1/8" to 1/4".**
10. [ ] **After overlapping bottom of brake lever, advance next wrap enough to end up above brake lever at completion of wrap, and overlap top of brake lever body by 1/8" to 1/4".**



28.22 *Wrap around the brake lever like this.*

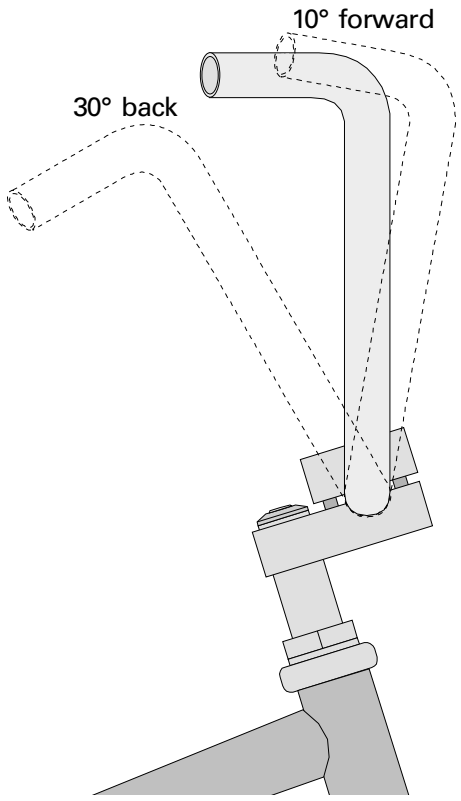
11. [ ] **Continue wrapping around upper bend of bar, maintaining 1/4 – 1/3 of tape overlap at outside bend of bar.**
12. [ ] **Finish wrapping with tape-edge flush to edge of fat center section of bar, then cut tape so end is on bottom side of bar.**
13. [ ] **Use colored friction tape or tape supplied with handlebar tape to cover last wrap, leaving end on bottom side of bar.**
14. [ ] **If using friction tape, use soldering iron or hot knife blade to weld end of friction tape to overlap.**
15. [ ] **Tuck any excess tape into bottom end of bar and install handlebar-end plugs (if any).**

OTHER BAR SYSTEMS

BMX/FREESTYLE

BMX handlebar positions

BMX and freestyle handlebars should be positioned with the rise of the bar ranging from 10° forward from straight up to 30° back. The normal position when setting up new bikes is with the rise of the bars pointing straight up.

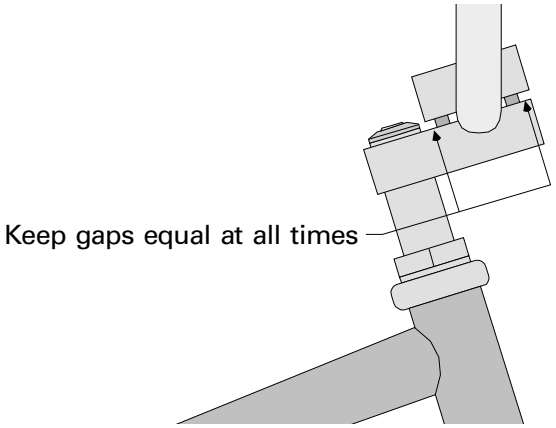


28.23 *Position BMX/freestyle bars in this range.*

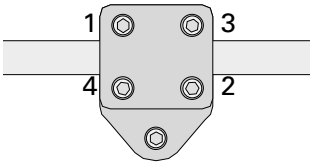
Securing BMX/freestyle stems

BMX/freestyle stems should be torqued in the fork to 170in-lbs (28lbs@6" or 42lbs@4").

Most BMX and freestyle bikes have a stem with four handlebar-binder bolts. The handlebar is sandwiched between two blocks of metal. When the binder bolts are secured, these two blocks need to remain parallel to avoid bending the bolts (see figure 28.24, below). In addition, the bolts should be tightened in a specific sequence to avoid effectively loosening one bolt while tightening another. Basically, this means always crossing over the handlebar to get to the next bolt. See figure 28.25 (below) for a tightening pattern. The bolts should be tightened in several stages, to a final torque of 240in-lbs (40lbs@6" or 60lbs@4").



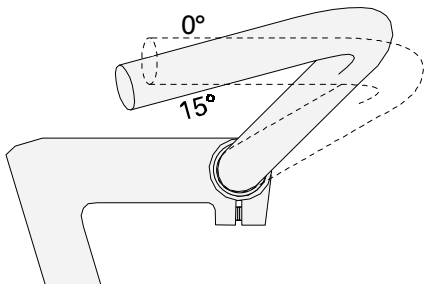
28.24 *Keep an even gap at the front and back of the bar clamp at all times.*



28.25 *Tighten the four bolts in this pattern.*

UPRIGHT BARS

See figure 28.26 for the acceptable range of handlebar positions.



28.26 *This the range of acceptable positions for upright bars.*

HANDLEBAR AND STEM TROUBLESHOOTING

Cause	***Solution***
SYMPTOM: *Wedge will not drop when tapping the stem-binder bolt with a ballpeen hammer.*	
Wedge is rusted in place.	Unthread handlebar-binder bolt, remove stem without wedge, drive wedge out with punch.
SYMPTOM: *Stem will not remove after the wedge has dropped.*	
Off-center hole in locknut is cutting into stem shaft.	Loosen headset locknut before removing stem.
Stem is corroded in place.	See procedure for removing difficult stems (page 28-6, steps 6 and 7).
SYMPTOM: *After loosening handlebar-binder bolt, bars will not slip easily through stem.*	
Handlebar bore had to be spread for installation, so in relaxed state it is still exerting pressure.	Insert something in compression slot to expand handlebar bore.
SYMPTOM: *Stem jams in bend of drop bar when installing or removing the stem from the bars.*	
Stem with wide bar clamp for MTB-type bars is being used on drop bars.	Do not use this combination if installing. Spread compression slot as much as necessary if removing the bars from the stem.
SYMPTOM: *Bar center is difficult to fit in stem.*	
Bar center is wrong dimension for handlebar bore in stem.	Measure both diameters. The bar should be no more than .2mm larger than the handlebar bore I.D. in the stem.
Stem is good fit, but handlebar-bore diameter is slightly collapsed or undersized.	Expand compression slot in stem after verifying stem and bar are compatible.
SYMPTOM: *Stem is difficult to install in fork column.*	
Stem is over-sized for fork column.	Measure stem O.D. and fork column I.D. Stem cannot be larger than fork column by any amount.
Headset-locknut seal is displaced.	Check seal and insert correctly if displaced.
Headset locknut has off-center hole.	Loosen locknut and install stem to test. Replace locknut to fix.
Corrosion in fork column or on stem shaft.	Clean stem shaft with emery cloth and hone inside of fork column.

(Continued next page)

HANDLEBAR AND STEM TROUBLESHOOTING (continued)

Cause	Solution
SYMPTOM: *Stem will not secure.*	
Stem was installed with stem-binder bolt too loose, and slope-style wedge has rotated 180° out of position.	Remove stem and install with stem-binder bolt no looser than necessary to get stem into fork column.
Stem-binder-bolt head, stem-binder-bolt threads, and wedge surface are not greased.	Grease all appropriate points.
SYMPTOM: *Handlebars slip when properly torqued.*	
Handlebar-binder bolt(s) need grease on threads and under head.	Grease handlebar-binder bolt.
Bars are undersized to handlebar bore in stem.	Measure both and make sure bar diameter is not more than .2mm less than bore diameter.
Bar center has collapsed or is worn out from previous slipping.	Remove bars and check condition of mating surface to stem.
Mating surfaces are contaminated.	Remove bars from stem and clean mating surfaces with alcohol or acetone.
Reinforcing sleeve has separated from handlebar.	Check if bar center sleeve is staying stationary when bar slips. If so, replace handlebar.
SYMPTOM: *After installing new handlebars, one side is lower than the other.*	
Stem was bent in a crash.	Replace stem.
SYMPTOM: *Handlebar extension or clip-on will not secure when bolts properly torqued.*	
Bolt heads and threads not greased.	Grease bolts.
Mating surfaces are contaminated.	Remove and clean mating surfaces.
Mating surfaces coated with paint or annodization.	Clean to raw aluminum with emery cloth.
Internal extension clamp, or radiused clip-on clamp diameter is wrong diameter for bar.	Change bar, or clip-on, or extension, for better fitting item.
SYMPTOM: *Handlebar-binder bolt breaks when torqued.*	
Torque was excessive for bolt diameter.	Check thread diameter and use appropriate torque.
If torque was correct, bar diameter is too small for stem, causing bolt to bend before bar is secured. **SYMPTOM:** *Stem-binder bolt breaks when torqued.*	Check fit and replace one item to improve fit.
Torque for steel bolts is being used on aluminum bolt.	Check material and use correct torque.
SYMPTOM: *Handlebars creak when riding.*	
Handlebar-binder bolt is loose.	Check torque.
Stem-binder bolt is loose.	Check torque.
Stem shaft is creaking inside fork column due to lack of grease.	Remove and grease stem shaft.
Headset is creaking.	Check headset for marginally-loose pressed races and loose headset locknut.
Reinforcement sleeve is creaking.	Can only be identified by eliminating all other choices. Try dripping penetrating Loctite into end of sleeve. If this fails, live with noise or replace handlebar.