6 – SIZING AND THREADING FORK COLUMNS

ABOUT THIS CHAPTER

This chapter is divided into two sections. The first is about sizing the fork column, which includes procedures for threaded and unthreaded columns, and the second section is about repairing fork-column threads or adding fork-column threads.

SIZING FORK COLUMNS

TERMINOLOGY

Fork column: The tube on the top of the fork that goes inside the head tube of the frame.

Screwed race: The portion of a threaded headset that threads onto the fork column directly against the upper bearings.

Threadless headset: A headset that does not thread onto a fork column; instead, the stem slips over the upper end of the fork column and is set against the topmost race of the headset and secured, which in turn sets the headset adjustment.

Threadless-fork column: A fork column that has no threads. A threadless-fork column must be used with a threadless headset.

PREREQUISITES

Stem and headset removal and installation

Sizing a fork column is generally done when installing a new fork in a bike. To do this, the stem and headset must be removed. At the completion of the fork sizing, the stem and headset will need to be installed. If unfamiliar with stem removal and installation, see the **HANDLEBARS, STEMS, AND HANDLEBAR EXTENSIONS** chapter (page 28-5). If unfamiliar with headset removal and installation, see the **HEADSET** chapter (page 11-9). In some cases the brake cable or front brake may need to be detached or removed in order to remove the stem.

INDICATIONS

The only reason for sizing a fork column is because a replacement fork is being installed and its fork column is too long for the combination of head tube length and headset height being used. A replacement fork might be installed because: the original one is damaged, the original one has a fork column that is too short, and the original one is being upgraded.

TOOL CHOICES

The diameter of the fork column determines which of several tool choices you will need. In the below list (table 6-1) there are several mitre jigs listed for aligning the saw blade when cutting the fork. These jigs for threaded-fork columns are unneces-

FORK-COLUMN-SIZING TOOLS (table 6-1)

Tool	Fits and considerations
Park FCG-1 plus 637 & 638	Fork alignment jig with inserts for all sizes of fork columns that doubles as a holder for fork column sizing
Bicycle Research FB1, FB2, & FB3	1", 1–1/8", and 1–1/4" clamp blocks that can be used as an inexpensive alternative to the Park FCG-1
Used 1" steel screwed race	Free guide used with Park FCG-1 for cutting 1" fork columns
Used 1–1/8" steel screwed race	Free guide used with Park FCG-1 for cutting 1–1/8" fork columns
Used 1–1/4" steel screwed race	Free guide used with Park FCG-1 for cutting 1–1/4" fork columns
Hacksaw	28–32 teeth per inch
Stein CG-3	Threadless-fork mitre that fits 1", 1–1/8", and 1–1/4" forks
Park SG-5	Threaded-fork mitres that fit 1", 1–1/8", and 1–1/4" forks
Stein CG-1	Threaded mitre for 1" × 24tpi
Stein CG-8	Threaded mitre for 1–1/8" × 26tpi
Stein CG-4	Threaded mitre for 1–1/4" × 26tpi
Park SG-6	Threadless-fork mitre that fits 1", 1–1/8", and 1–1/4" forks

sary if the shop is equipped with a Park FT-4 or Park FCG-1 fork alignment jig. These jigs, in conjunction with a used steel screwed race for each diameter of fork column, make a more-than-adequate jig for aligning the saw blade. The mitre jigs are indispensable for threadless forks. The preferred choices are in **bold**. A tool is preferred because of a balance among: ease of use, quality, versatility, and economy. When more than one tool for one function is in **bold** it means that different tools are required for different configurations of parts.

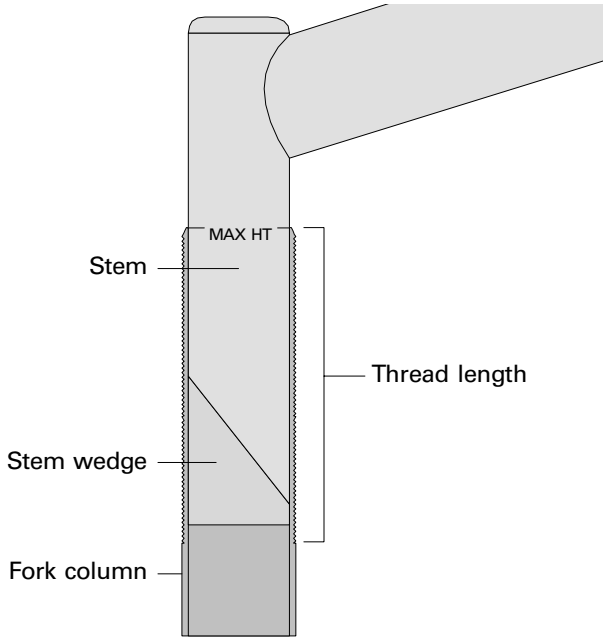
TIME AND DIFFICULTY

On a bare fork, sizing the fork column is a 5–7 minute procedure of little difficulty.

COMPLICATIONS

Too much thread left

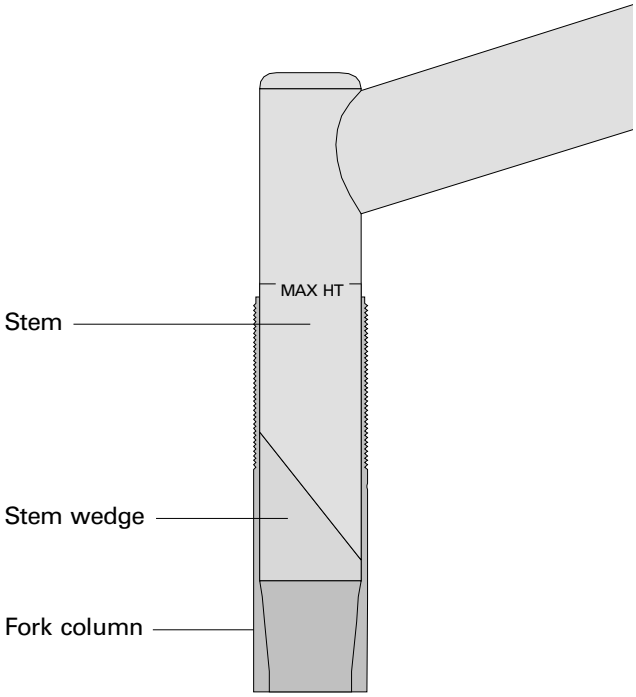
It is possible to have too much thread on the fork column after sizing it. For safety, it is important that the stem wedge end up below the threaded portion of the fork column, so that the fulcrum and stress is not in the weak threaded portion of the fork column. The only way to prevent this is to start with a fork that is not threaded too far down. In borderline situations it may be necessary to insert the stem so that the minimum insertion or maximum height mark is below the top of the fork. If this positions the bars too low, then a stem with more height should be installed.



6.1 *The fork-column thread is too long if the bottom of the stem/wedge is above the bottom of the thread.*

Stem will not go in far enough

With some short frames, the fork column can end up short enough that the stem will not install far enough. Near the base of the fork column the I.D. is usually reduced to take advantage of the strength that a thicker wall provides. On most forks, the diameter reduction is well below the deepest point the stem inserts to. On short fork columns, the diameter reduction interferes with stem insertion. Different forks start this diameter reduction at different heights. The best way to check for this problem before cutting the fork is to insert a seat post of the same diameter as the stem into the fork column, and see how far it will install. Some BMX seat posts are the same diameter as the common 22.2mm stem. A 25.4mm seat post is close enough to the size of stem that goes in a 1–1/8" fork column. A 28.6mm seat post is a decent fit inside a 1–1/4" fork column.



6.2 *The fork is unacceptable because the stem will not install far enough because of the change of diameter inside the fork column.*

Cut too short

If the fork column has been cut too short and the headset locknut will not engage properly, try the following procedures.

Try dispensing with any simple flat washers in the headset. They are used to adjust stack height and improve locknut security. Locknut security can be improved with Loctite 242 instead.

If there are any brackets for reflectors, consider an alternate location. If there is a brake cable hanger, consider one built into the stem. It may also be possible to find thinner brackets.

Consider a new headset with a shorter overall stack height.

Use a head tube reamer/facer to shorten the head tube. It is best to remove material from the top as much as possible before removing any from the bottom. Shortening the head tube is a drastic solution that should only be considered when all other alternatives have been exhausted.

Cut too long

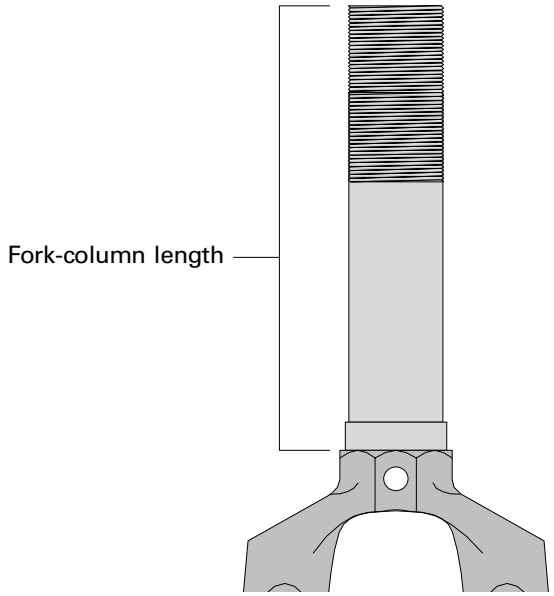
If for some reason, the fork column has been cut too long, and the headset locknut will not tighten against the headset washers and screwed race, add more washers to the headset. This correction will work for error less than or equal to 5mm. For error greater than 5mm, cut the fork column to the appropriate length.

THREADED-FORK-COLUMN SIZING PROCEDURE

1. [ ] Use appropriate procedure/worksheet to remove headset and fork.

Determine the correct fork-column length by one of two methods.

If replacing an existing fork and re-using an existing headset, then determine the correct fork-column length simply by measuring the fork that is being replaced. Measure from the top of the fork column down to the crown-race seat (top of the fork crown).

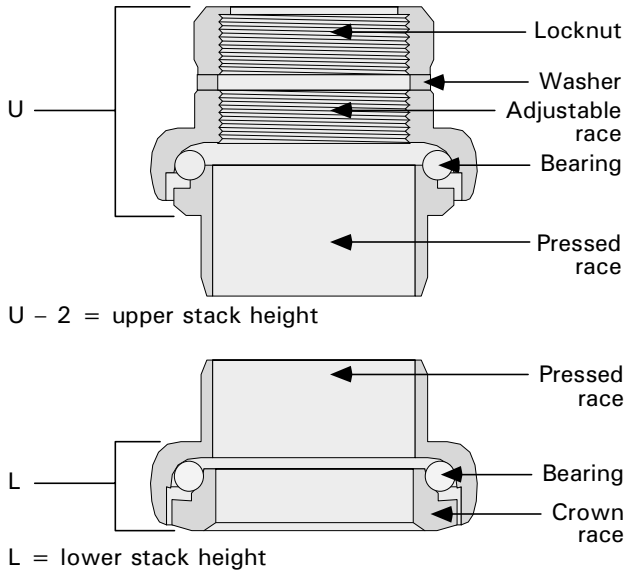


6.3 Measure fork-column length here.

If there is no original fork to measure, or if you do not know whether the original fork column was a suitable length, or if the headset is being changed, then the correct fork-column length must be calculated by adding the headset stack height to the head tube length.

The headset consists of two *stacks*. The lower stack consists of: the fork crown race, lower ball bearings, and lower race (which is pressed into the head tube). Assemble these parts and measure all but the portion of the lower head tube race that is inserted inside the head tube. This combined measurement is the lower stack height.

The upper stack consists of: the upper race (which is pressed into the head tube), the upper ball bearings, the race that screws onto the fork column, any washers that will be used, any brackets (reflector or brake cable hanger) that will be used, and the locknut(s). Assemble and measure the upper stack except for the portion of the upper head tube race that will be inserted in the head tube, then subtract 2mm to determine the upper stack height.



6.4 Measure U, then subtract 2mm to determine the upper stack height of the headset. Measure L to determine the lower stack height of the headset.

The correct fork-column length is the sum of the lower stack height, the upper stack height, and the head tube length.

2. Determine correct fork-column length by one of these two methods:

[ ] If using same headset, measure existing fork column and record length here: _____mm.

[ ] If installing new headset or there is no original fork to match:

Measure head tube length: _____mm

Measure headset lower stack: + _____mm

Measure headset upper stack: + _____mm

Total is correct column length: = _____mm

When sizing the new fork, it is easier to set the mitre to the correct position to remove the *excess* length than it is to set the mitre to leave the *correct* length. For this reason, the calculated-correct length is subtracted from the new fork's actual length to determine the amount of excess to remove (in the next step).

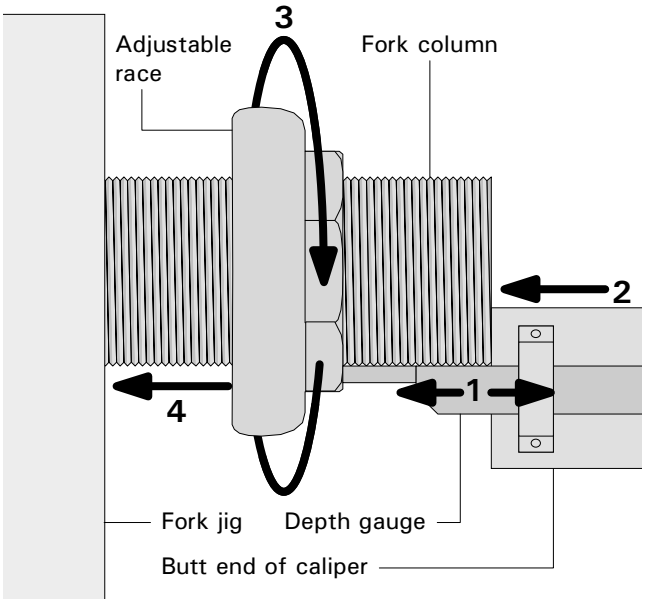
3. [ ] Measure new fork-column length and record here: _____mm.

4. [ ] Determine excess column to remove:

Step 3 length:	**_____mm**
Subtract step 2 length:	**–_____mm**
Excess to remove:	**=_____mm**

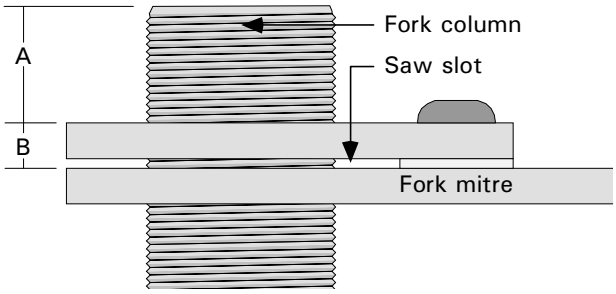
Setting the fork in the correct position to cut just the right amount of excess off is a different procedure depending on what system is being used to guide the hacksaw blade. Either a fork alignment jig and old steel screwed race can be used, or a threaded-fork mitre jig.

To set up the fork-alignment-jig system, insert the fork in a Park FT-4 or Park FCG-1, but do not secure it; later, when the length to be cut off has been set, the fork will be secured in the jig. Bicycle Research frame tube blocks (in the appropriate size) provide an inexpensive way to hold the fork column in a vise. Thread on an appropriately-sized steel headset race. Set the depth indicator of a caliper to the dimension of the excess length to be removed and use the caliper to position the screwed race so that only the excess length is exposed past the screwed race. Slide the fork in the alignment jig so that the screwed race butts against the jig, then clamp the fork column securely in the jig.



6.5 To set the proper amount of fork column to be removed; 1. set the depth gauge of the caliper to the desired amount, 2. butt the end of the caliper against the end of the fork column, 3. rotate the adjustable race up the fork column until it butts against the depth gauge, 4. slide the fork-column assembly until the race butts against the fork jig.

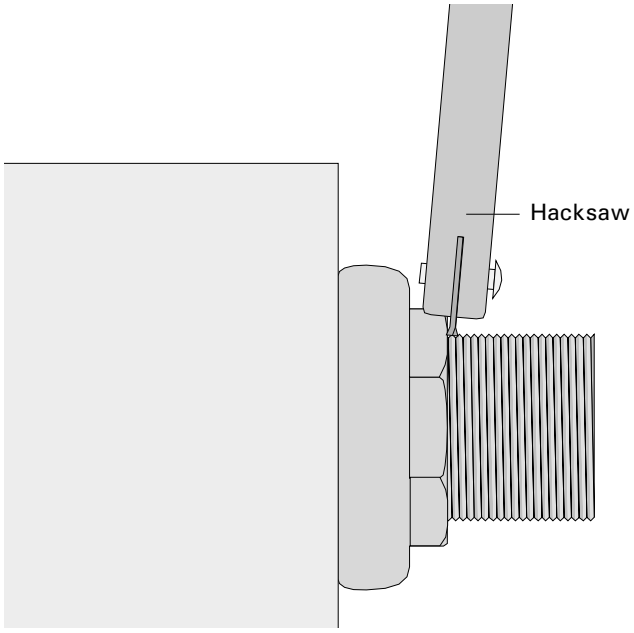
If using a threaded mitre jig, then the distance from the bottom edge of the saw blade slot to the top face of the mitre must be measured. This dimension must be subtracted from the excess column length to be removed. Adjust the fork in the mitre until the amount of exposed fork column is equal to the amount of this calculation.



6.6 A plus B equals excess fork-column length.

5. [ ] Insert fork in mitre or saw guide system and adjust so blade will remove no more column length than step 4.

When cutting the column using an old steel screwed race as a guide, angle the hacksaw slightly towards the screwed race to get as flush a cut as possible. The screwed race will be of a hard enough steel that the saw blade will not cut it. Use a bastard file to file the cut flush to the face of the screwed race if the hacksaw does not cut flush.



6.7 Angle the hacksaw blade towards the screwed race.

If using a threaded mitre, make sure that the fork column does not rotate in the mitre during the cut.

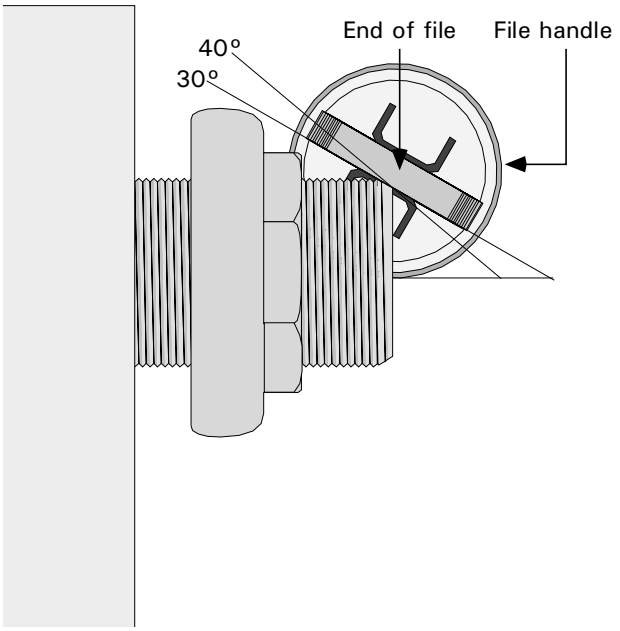
6. [ ] Cut off excess column length.

The saw will leave a burr inside the fork column that will interfere with stem installation. Use a deburring tool (United Bicycle Tool GN-BHE) or a small round file to remove this burr.

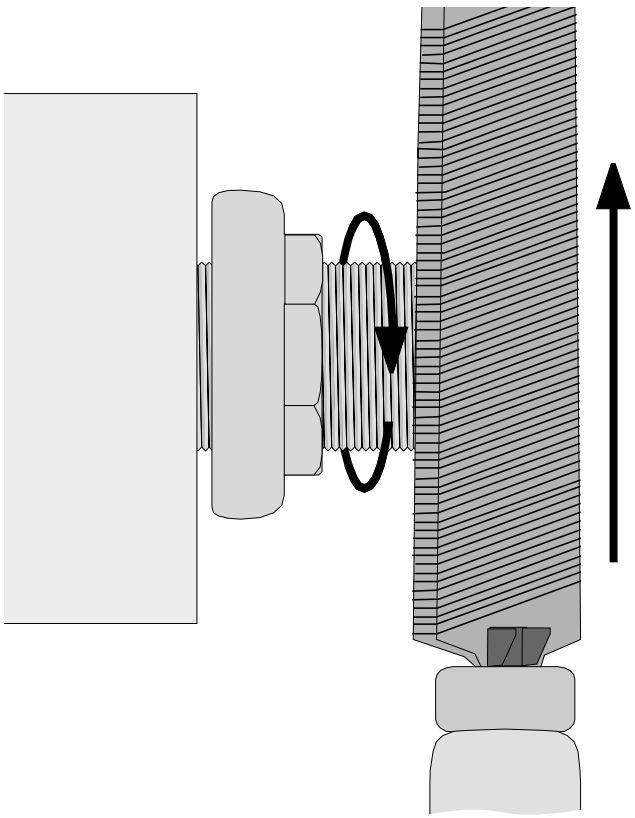
7. [ ] Remove burr inside fork column.

The saw cut leaves the first thread on the fork column in a condition that will make it difficult to start a screwed race when assembling the headset. The technique to improve the first thread differs depending on which system was used to guide the saw.

If the system used was the fork alignment jig and the used steel race, loosen the alignment jig clamp, push the fork through, and thread down the screwed race so that it is about 10mm from the end of the fork column. Leave the clamp loose enough so that the fork can easily be rotated. Put a flat mill bastard file on the cut end of the fork column at an angle that is closer to parallel to the axis of the column than it is perpendicular to the axis of the column (between 30° and 40°). Push the file forward while rotating the fork against the direction of the file stroke. Continue rotating and filing around the column several revolutions until there is a taper all the way around with a length of one to two threads.



6.8 *Filing a taper on the end of the fork. The file should be used at an angle of 30–40° from the axis of the fork column.*



6.9 *Filing a taper on the fork threads.*

If using a threaded-fork mitre, remove the mitre from the vise but not the fork and thread it down the fork column so about 10mm of thread is exposed. Holding the fork in your hand, use a mill bastard file to file a steep taper all the way around the end of the fork column that is one to two threads long.

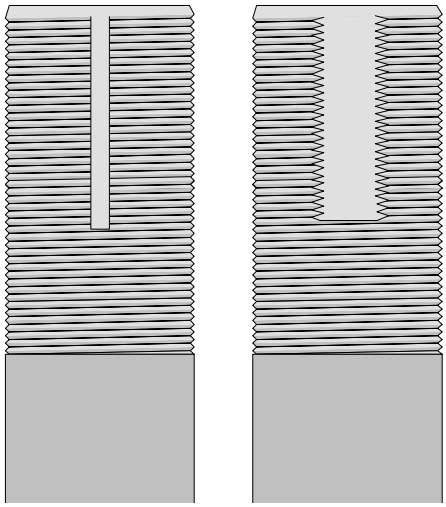
8. [ ] Taper outside thread.

To chase the threads, simply unthread the mitre or screwed race that was used to guide the saw.

9. [ ] Chase threads.

Most forks come with a slot in the threads that accommodates a key on a headset washer. Sometimes when a fork column is shortened there is not enough slot length left. It is difficult and unnecessary to lengthen the slot. The easiest solution is to remove the key from the washer or brackets. The key is a convenience item, but not required; in fact, the washer or bracket with the key often rotates, and when the key rotates out of its slot, it mangles threads.

If it is desired to keep the key and slot system, extend the slot with the edge of a small (6") flat file, or with the edge of a grinding disk on a rotary tool. Another alternative is to file the threads flat. This will allow the key to rotate some, but not all the way around the fork column.



6.10 On the left are fork threads with a slot in them; on the right are fork threads that have been filed flat.

10. [ ] Modify or replace headset washers if slot in fork-column threads is no longer long enough to accommodate key in any keyed washers.

11. [ ] Use appropriate procedure/worksheet to install fork, headset, and stem.

THREADLESS-FORK COLUMN SIZING PROCEDURE

1. [ ] Use appropriate procedure/worksheet to remove headset and fork.

Determine the correct fork-column length by one of two methods.

If replacing an existing fork and re-using an existing headset, then determine the correct fork-column length simply by measuring the fork that is being replaced. Measure from the top of the fork column down to the crown-race seat (top of the fork crown).

If there is no original fork to measure, or if you do not know whether the original fork column was a good length, or if the headset is being changed, then the correct fork-column length must be calculated.

To calculate the correct fork-column length, assemble the headset into the head tube and place the fork into the headset. Put all washers and brackets in place that will be between the top of the headset and the stem. Slide the stem onto the fork column, but do not secure it. Measure the amount of fork column extending above the stem. Add 3mm to the amount of fork column exposed to determine the amount of excess length. When assembled, the top of the fork column is supposed to be 3mm below the top of the stem.

2. Determine correct fork-column length by one of these two methods:

[ ] If using same headset, measure existing fork column and record length here: _____mm.

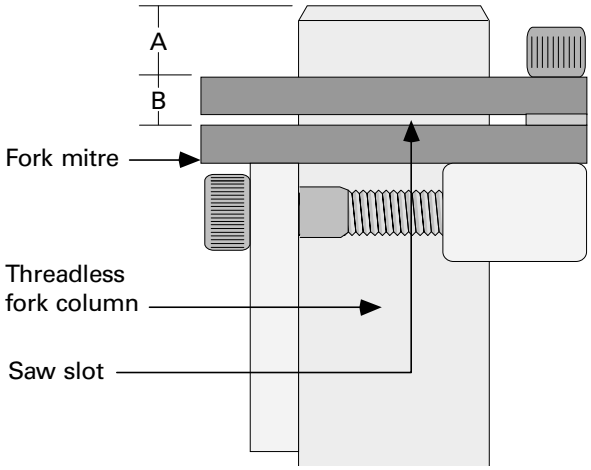
[ ] If installing new headset, or there is no original fork to match, assemble fork and headset into frame and install stem:

Measure protruding column: _____mm

Add 3mm: +3 mm

Total is excess column length: =_____mm

Setting the fork in the correct position to cut exactly the right amount of excess off is simply of a matter of putting the jig on the fork column and measuring from the top of the jig to the end of the fork. This dimension should be the excess length minus the distance from the bottom of the saw slot to the top face of the jig.



6.11 A plus B equals excess fork-column length.

3. [ ] Remove fork from headset.

4. [ ] Insert fork in mitre, so blade will remove no more column length than step 2.

5. [ ] Cut off excess column length.

6. [ ] Remove cutting jig from fork column.

The saw will leave a burr on the inside of the fork column that will interfere with star-nut or expansion plug installation. Use a deburring tool or a small round file to remove this burr.

7. [ ] Remove burr inside fork column.

The saw cut will leave a burr on the outside of the fork column that will make it difficult to slide the stem on. Use a mill bastard file to lightly dress the outside edge of the cut.

8. [ ] File off burr on outside of column.

9. [ ] Use appropriate procedure/worksheet to install fork, headset, and stem.

FORK-COLUMN-THREAD CHASING AND EXTENDING

TERMINOLOGY

Thread die: Sometimes referred to as just "die," is a tool for cutting or improving external threads. It is the opposite of a tap.

Thread chasing: Sometimes referred to as just "chasing," it is to use a die to improve the condition of existing threads.

PREREQUISITES

Stem and headset removal and installation

Chasing threads, or extending threads, on a fork column is done when a fork is out of the bike. In order to chase or extend threads, the headset and fork must be removed. The stem and headset must come out to do this if they are in place when the job is begun. At the completion of the job, the stem and headset will need to be replaced. If unfamiliar with stem removal and installation, see the **HANDLEBARS, STEMS, AND HANDLEBAR EXTENSIONS** chapter (page 28-5). If unfamiliar with headset removal and installation, see the **HEADSET** chapter (page 11-9). In some cases the brake cable or front brake may need to be detached or removed in order to remove the stem.

INDICATIONS

Symptoms indicating need for thread chasing

Thread chasing on a fork column is needed whenever parts are difficult to thread on or off of the fork. The cause may be cross-threading a part on, threads damaged from impact while exposed, rust on the threads, or damage from a key on a washer or bracket that has been rotated out of its slot and into the threads.

Symptoms indicating need for thread extending

The threads need to be extended whenever the fork that must be used does not have enough thread for the screwed race to thread all the way down to compress the bearings between the stationary and rotating upper races of the headset. The usual cause for this problem is that an inappropriate fork has been selected as a replacement. *Always pursue to the limit the option of finding a fork with more threads before cutting a fork that will need its threads extended.* On rare occasions there is no fork available that has threads far enough down the fork column.

TOOL CHOICES

Tool choices are determined in part by the diameter and thread description of a particular fork column that will be chased or have threads extended. The following list (table 6-2) covers all tools required for the job. The preferred choices are in **bold**. A tool is preferred because of a balance among: ease of use, quality, versatility, and economy. When more than one tool for one function is in **bold** it means that different tools are required for different configurations of parts.

FORK-THREAD-DIE TOOLS (table 6-2)

Tool	Fits and considerations
Campagnolo 714	Complete handle and die for BSC 1" × 24tpi (not useable for extending threads)
Campagnolo 714/F	25mm × 1mm French die for Campagnolo 714
Campagnolo 714/I	25.4mm × 24tpi Italian die for Campagnolo 714
Campagnolo 714/8OS	Complete handle and die for 1–1/8" × 26tpi threads
Hozan C421	Complete handle and die for BSC 1" × 24tpi threads
Hozan C421/8	Complete handle and dies for BSC 1" × 24tpi and 1–1/8" × 26tpi threads
Hozan C432	Complete handle and dies for 1–1/8" × 26tpi and 1–1/4" × 26tpi threads
Park FTS-1	Complete handle, dies, and pilots for BSC 1" × 24tpi, 1–1/8" × 26tpi, and 1–1/4" × 26tpi threads
VAR 40S	Complete handle and die for BSC 1" × 24tpi threads
VAR 40S18	Complete handle and die for 1–1/8" × 26tpi threads
VAR 40S14	Complete handle and die for 1–1/4" × 26tpi threads

TIME AND DIFFICULTY

This moderately difficult job takes a highly variable amount of time depending on the amount of thread length that needs to be added; furthermore, frequent long pauses are required to allow the material to cool. The actual working time could easily vary from 5 to 30 minutes.

COMPLICATIONS

Threads too stripped to fix with chasing

Threads can strip to the point that chasing them with a die will not restore their usability. If this is suspected, chase them anyway and try torquing the screwed race and locknut together on the fork column with all the washers and brackets that will be used between them. If the threads hold up to this torque test then the fork is useable. If not, a new fork is needed.

Chrome-moly steel making fork unsuitable for thread extension

The tools used for extending threads are not actually designed for that purpose. With softer metals it usually can be done, but even with the best of tools and techniques the result on high quality chrome-moly tubing may be disastrous, resulting in a trashed fork and a dull die.

Titanium

Titanium has completely different metallurgical characteristics than steel or aluminum. It is necessary for the die to be designed in a dramatically different way to be suitable for threading titanium. Once designed to be suitable for titanium it will no longer be suitable for other materials. Special dies for titanium are not yet available, but whether enough titanium forks will be encountered that need thread repair or extension is a significant question.

Aluminum

Aluminum is a perfectly suitable material for threading, but presents some special concerns to the mechanic. *The type of cutting oil used is critical*. There are cutting oils made specifically for use on aluminum. Any cutting oil that is suitable will specify for use on aluminum on the container. Do not interpret words such as “all-purpose” and “multi-purpose” to mean: includes aluminum.

For good quality results it is also critical that the die be very sharp.

Chrome plating

Chrome-plated fork columns can be threaded, but it wears the tool much faster.

CARE OF FORK-COLUMN-THREADING TOOLS

Fork-column-threading tools are very expensive and easily damaged. Proper cutting technique is important to get good life from them, but that is not all. When storing fork-column-threading tools make sure they are clean and coated with oil. The cutting edges are easily chipped by light impact with other metal objects, so handle them and store them in a way that this will not happen. On hooks on a pegboard is a good way to store fork-column-threading tools.

When cleaning fork-column-threading tools use a brush and solvent. Blowing them clean with compressed air is not damaging to the cutting edges but is dangerous because of flying metal debris. Coat the cutter with a light oil after cleaning and drying.

THREAD DESCRIPTIONS

Table 6-3 shows the pitch and diameter measurements for all fork-thread types. Diameters can vary slightly within a range but still be the same standard.

FORK-THREAD TYPES (table 6-3)

Pitch	Measured O.D.	Thread name and nominal description
24tpi	25.1–25.3mm	BSC 1" × 24tpi
24tpi	25.1–25.3mm	Italian 25.4mm × 24tpi*
1mm	24.7–24.9mm	French 25mm × 1mm
26tpi	28.3–28.5mm	Oversize 1–1/8" × 26tpi
26tpi	31.5–31.7mm	Oversize 1–1/4" × 26tpi

* Italian is interchangeable with BSC. After chasing an Italian thread with a BSC die, the headset should still fit.

FORK-THREAD-CHASING PROCEDURE

1. [ ] **Measure thread pitch and record here (circle correct units): _____mm/tpi.**
2. [ ] **Measure fork thread outside diameter and record here: _____mm.**
3. [ ] **Find in FORK-THREAD TYPES (table 6-3) matching pitch and diameter and record corresponding nominal description here: _____.**
4. [ ] **Verify die of correct thread type is in handle.**

VAR and Hozan dies have adjustable diameters. In the next step, the die diameter needs to be enlarged. A set screw or bolt, 90° from the split in the die, needs to be loosened to allow expansion. A set screw or bolt at the split is tightened to expand the die. Once the diameter is set, the set screw or bolt 90° from the split is tightened to secure the die in the handle.

5. [ ] **If die diameter is adjustable, adjust to largest diameter.**
6. [ ] **Apply cutting oil to threads and die.**

When cutting threads, always use a technique called "cut-and-clear." Once resistance is encountered by the die, advance it no more than 1/4 turn. This is the "cut" segment. After the cut has been done, back the die off about 1/2 turn. This is the "clear" segment, named so because this action clears the fresh cut fragments away from the cutting edges. Advance the die until resistance is encountered again, and repeat the cut-and-clear technique.

7. [ ] **Thread die onto fork, using cut-and-clear technique when resistance is encountered (adding cutting oil repeatedly).**

If an adjustable die was used for the first pass, it probably did the bulk of the thread clean-up, but another pass is needed to finish. In the next step the die is adjusted again, preferably while on a portion of the threads where there is no damage. When making the adjustment, the die should jiggle imperceptibly, or if there is no jiggle it should be clear that no cutting is occurring when the die is rotated in the undamaged portion of the threads.

8. [ ] **If die diameter is adjustable, adjust die diameter to as snug as possible without cutting, on portion of thread where no damage was evident.**
9. [ ] **Run die over full length of damaged threads, using cut-and-clear technique when resistance is encountered (adding cutting oil repeatedly).**
10. [ ] **Remove die and clean fork and tool.**

FORK-THREAD-EXTENDING PROCEDURE

1. [ ] **Determine length of additional thread needed and note here: _____mm.**
2. [ ] **Measure thread pitch and record here (circle correct units): _____mm/tpi.**
3. [ ] **Measure fork thread outside diameter and record here: _____mm.**
4. [ ] **Find in FORK-THREAD TYPES (table 6-3) matching pitch and diameter and record corresponding nominal description here: _____.**
5. [ ] **Verify die of correct thread type is in handle.**

VAR and Hozan dies have adjustable diameters, by virtue of a split in the die. Brands of dies that have no split cannot be used for extending threads. In the next step, the die diameter needs to be enlarged. A set screw or bolt, 90° from the split in the die, needs to be loosened to allow expansion. A set screw or bolt at the split is tightened to expand the die. Once the diameter is set, the set screw or bolt 90° from the split is tightened to secure the die in the handle.

6. [ ] **Adjust die to largest diameter (handle should jiggle up and down obviously).**
7. [ ] **Apply cutting oil to threads and die.**

In the next step, thread the die down as far as it easily goes. Once resistance is met, the die is all the way down the existing threads and the cutting of new threads is about to begin. Use a caliper to measure how far the die is from the top of the fork column so that the progress of extending the threads can be monitored.

8. [ ] **Thread die onto fork until die reaches end of existing threads.**
9. [ ] **Use depth gauge to measure exposed thread from top of fork column to top of die and record here: _____mm.**
10. [ ] **Add step 1 to step 9 to determine amount of exposed threads that will be above die when extending threading is complete. Note result of calculation here: _____mm.**

Extending the threading on a fork is a misuse of a fork die. What is likely to suffer, however, is the fork. If extreme care is not take to avoid heat buildup, then the fork column will expand in the die, resulting in galled threads and undersized thread diameter. Four techniques can be used in combination to avoid heat buildup.

Use an expandable die so that the threads can be cut to partial depth on the first pass, and then be cut progressively deeper on the second pass and the last pass.

Use a very conservative cut-and-clear technique. Advance the die no more than 1/8 turn into the resistance (cut), then back off 1/4 turn (clear) before starting again.

After completing one complete revolution of the die, take a break for long enough to be sure all heat has dissipated. Fifteen minutes should generally be enough. Compressed air could be used to speed the cooling, but there is a risk of blowing sharp metal fragments about in a dangerous fashion.

Flood the threads with ample quantities of fresh cutting oil to absorb the heat while it is being created. For this to work, the oil should be applied about once per full die revolution in a quantity that will wash away the last application of oil.

When using a nice sharp die on a carbon-steel fork, this combination of techniques should result in a good quality job, although a very time-consuming one. If a dull die is used, or if the fork is high-quality chrome-moly steel, there is no guarantee that the result will be acceptable.

11. [ ] Use cut-and-clear technique to advance die down fork column, stopping to let metal cool after every full revolution and adding cutting oil each time before re-starting.

12. [ ] Stop cutting when top of die is below end of fork by amount in step 10.

Now that one pass has been completed, a second one must be done at a slightly smaller diameter. This will not be the final pass, so adjust the die diameter so that it has noticeably less jiggle on the original threads then the first setting, but it still jiggles. This pass will cut substantially less metal than the first, so it is not necessary to take a long rest in between every revolution. Bigger turns for the cut-and-clear technique can be used, as well (1/4 turn for the cut and 1/2 turn for the clear).

13. [ ] Turn die up until it is fully on original threads and adjust diameter tighter, but leaving somewhat loose (jiggling).

14. [ ] Repeat steps 11 and 12.

For the final pass the die should be returned to the original threads and adjusted as tight as it will go without cutting when turned on the original threads. There should be little or no apparent jiggle between the die and the threads.

15. [ ] Turn die up until it is fully on original threads and adjust diameter tighter until jiggling is gone or near gone, but cutting does not occur when die is rotated.

16. [ ] Repeat steps 11 and 12.

17. [ ] Remove die from fork.

18. [ ] Clean fork and tools with brush and solvent then coat die with oil.