Reaming and Facing Instructions for InSet™ Headtubes

CHRIS KING®

Reaming and Facing Cutting Tool Kits

Chris King reaming and facing tool kits are available in several different configurations, each catering to a specific range of head tube sizes and configurations. Note that the Large Diameter kit requires pieces from the Small Diameter kit to function properly.

Small Diameter "SD" InSet kit:

- Reaming: 1-1/8" InSet (44.00 mm head tube ID)
- Facing: external bearing headtubes in 1", 1-1/8" and 1-1/4"; 1-1/8" InSet (44.00 mm head tube ID)
- Tools included: SD Reaming Tool, SD Facing tool, SD Head Tube Bushing, SD Reamer Stop Plate, Reaming and Facing Nut, SD Guide Cone, Chris King soy-based cutting oil

Large Diameter "LD" InSet kit:

- Reaming: 1.5" InSet (55.95 mm head tube ID)
- Facing: external bearing headtubes in 1-1/8", 1-1/4" and 1.5"; 1.5" InSet (55.95 mm head tube ID)
- Tools included: LD Reaming Tool, LD Facing Tool, LD Head Tube Bushing, LD Reamer Stop Plate, LD Guide Cone Adaptor, Chris King soy-based cutting oil

General Cautions and Warnings

- **Contact the bicycle frame manufacturer for specific reaming and facing information and guidelines before reaming and facing the frame.**
- **It is strongly recommended that the following procedure is performed by a trained professional bicycle mechanic.**
- **Always turn the cutting tools in a clockwise direction only. Never turn the tool in a counter clockwise motion, as this will damage the cutting edges, comprising cutting sharpness and accuracy.**
- **Reaming and facing are two separate operations. Always perform reaming operations before facing operations. Do not attempt to perform both operations simultaneously as this will yield inconsistent results.**
- **Use light pressure when performing cutting operations. The use of excessive pressure will cause the cutters to dig into the frame material, yielding inconsistent results.**
- **Reaming the head tube deeper than the frame manufacturer's specifications may compromise the structural integrity of the head tube. An improperly reamed head tube may cause frame failure, loss of control of the bicycle while riding, serious injury or death.**

InSet™ headset specifications

type	headset	headtube opening	head tube ID (tolerances)	fork steerer tube	maximum press fit	fork crown seat OD	stack height[1]	minimum ream depth	stem cap screw torque	convertability[2]
internal	I1	upper	44.00 mm (+0.00, -0.05)	1-1/8"	0.1 mm	n/a	8.2 mm	8.5 mm	1.7 Nm (15 in.lbs)	no
		lower	44.00 mm (+0.00, -0.05)	1-1/8"	0.1 mm	30.1 mm	4.2 mm	8.5 mm	1.7 Nm (15 in.lbs)	no
	I2	upper	44.00 mm (+0.00, -0.05)	1-1/8"	0.1 mm	n/a	8.2 mm	8.5 mm	1.7 Nm (15 in.lbs)	no
		lower	55.95 mm (+0.00, -0.05)	1.5	0.05 mm	39.8 mm	4.0 mm	11.0 mm	1.7 Nm (15 in.lbs)	yes
	I4	upper	49.61 mm (+0.00, -0.04)	1-1/8"	0.075 mm	n/a	8.0 mm	16.0 mm	1.7 Nm (15 in.lbs)	no
		lower	49.61 mm (+0.00, -0.04)	1-1/8"	0.075 mm	30.1 mm	4.0 mm	16.0 mm	1.7 Nm (15 in.lbs)	no
internal | external	I3	upper	44.00 mm (+0.00, -0.05)	1-1/8"	0.1 mm	n/a	8.2 mm	8.5 mm	1.7 Nm (15 in.lbs)	no
		lower	49.61 mm (+0.00, -0.04)	1.5	0.075 mm	39.8 mm	14.0 mm	20.0 mm	1.7 Nm (15 in.lbs)	yes
	I5	upper	49.61 mm (+0.00, -0.04)	1-1/8"	0.075 mm	n/a	8.0 mm	16.0 mm	1.7 Nm (15 in.lbs)	no
		lower	49.61 mm (+0.00, -0.04)	1.5	0.075 mm	39.8 mm	4.0 mm	16.0 mm	1.7 Nm (15 in.lbs)	yes
	I7	upper	44.00 mm (+0.00, -0.05)	1-1/8"	0.1 mm	n/a	8.2 mm	8.5 mm	1.7 Nm (15 in.lbs)	no
		lower	44.00 mm (+0.00, -0.05)	1.5	0.1 mm	39.8 mm	14.0 mm	9.5 mm	1.7 Nm (15 in.lbs)	yes

[1]upper stack height = upper cup + bearing cap. lower stack height = lower cup + baseplate.

[2]convertible to fit a 1-1/8" or 1.5 steerer tube, depending on baseplate and/or bearing cap selection. Small parts are available through any authorized Chris King dealer, or directly from

Reaming Step 1: Prepping the Workspace

List of Materials Needed for Job

- Park™ Tool HTR-1 or HTR-1B
- Chris King Reamer tool set
- Heavy duty bicycle workstand
- Chris King soy cutting oil or similar cutting fluid
- Clean rags
- Appropriate hex wrenches (for stem pinch bolts)
- Optional work gloves
- Optional safety glasses
- Optional compressed air (to clean off tool)
- Garbage can (for shavings)

Cautions and Warnings

- A good workstand is necessary for this procedure to secure the bike and make for easy work
- Contact with conventional cutting fluid may cause skin irritation. It is a good idea to wear latex gloves when working with it.
- It is advised that frame preparation be performed by a trained professional bicycle mechanic who is familiar with the procedure. For additional information and videos, showing proper reaming and facing techniques using our tools, please visit our website: http://www.chrisking.com

Reaming Step 2: Setting up Frame

1. Secure the frame in the workstand as recommended by the bicycle frame manufacturer.
2. Position the frame so that you can work with the reaming tool at waist height.
3. Place garbage can underneath frame to catch shavings

Reaming Step 3: Assembling the Tool

Materials Needed for this Procedure

1. Park™ Tool HTR-1 or HTR-1B
2. Chris King Reaming Cutter
3. Chris King Reaming and Facing Nut (with Head Tube Bushing removed)
4. Chris King Reamer Stop Plate
5. Chris King Guide Cone (plus LD Guide Cone Adaptor if reaming a 1.5″ or 1.5″ InSet head tube)

The following section assumes that you already have a fully assembled Park Tool – you'll need to remove the existing Park parts and replace them with Chris King Reaming Tools. If you have already disassembled your Park Tool, please skip ahead to Assembly of the tool.

Disassembly

1. Remove the clamping mechanism from the Park™ Tool HTR-1 or HTR-1B
2. Replace the Park™ Radial Centering Cone with the Chris King Guide Cone. The Chris King cone can remain on the clamping mechanism from job to job, you only need to make this swap once.
3. The Park Centering Cone is held in place with a circlip. To remove the circlip, place the clamping mechanism on its base on a flat surface.
4. Press down on the Park Centering Cone to reveal the circlip.
5. Using channel locks or pliers, pull the circlip out of its groove.
6. Remove the Park Centering Cone
7. Save the circlip, you'll use it to hold the new Guide Cone in place.
8. Save the Park™ nylon (white) bearing, you will use it with the King guide cone.
9. Using an appropriately sized wrench, remove the existing Park™ Nut. This will be replaced with a Chris King Reaming and Facing Nut.

10. Remove the existing cutter.
11. You should now have a T handle tool with no tools or parts on it.

Assembly and Tool Setup

1. Pass the T handle's threaded rod through the Chris King Stop Plate, then the Chris King Reaming Cutter. The cutter head and laser marking should be facing away from the T handle.
2. Invert the T handle so that the cutter rests on the base of the handle freely (you don't have to hold it in place).
3. Lightly oil the threads of the T handle near the cutter where the old Park™ nut formerly was.
4. Thread on the new Chris King Reaming and Facing nut, the end with wrench flats should be opposite from the cutter. Be sure that the Head Tube Bushing is not installed on the Reaming and Facing Nut, as this is only needed during the facing operation.
5. Tighten the nut firmly against the cutter to hold it in place. The T handle end of the tool is now assembled.
6. Reassemble the clamping mechanism with the King Guide Cone. Place the nylon (white) bearing over the clamping mechanism shaft (blue)
7. Place the King Guide Cone over the nylon bearing, the widest part of the cone (base) should be closest to the large black spring.
8. Depress the Guide Cone to reveal the groove for the circlip.
9. Install the circlip, pressing firmly until you hear it "snap" in place. This will hold the assembly together.
10. If reaming a 1.5 or 1.5 InSet head tube, slide the LD Guide Cone Adaptor over the Guide Cone.
11. The T handle facing tool assembly is complete and ready to be installed into the head tube.

Reaming Step 4: Starting the Job

Cautions and Warnings

- **Always turn the cutting tools in a clockwise direction only. Never turn the tool in a counter clockwise motion, even when pulling the reamer out of the frame. This will damage the cutting edges, comprising cutting sharpness and accuracy.**
- **Reaming and facing are two separate operations. Always perform reaming operations before facing operations. Do not attempt to perform both operations simultaneously as this will yield inconsistent results.**
- **The Park Tool uses spring tension to draw the cutting tools into the frame. Use only enough tension to gently cut material away. It is not necessary to exert a lot of force while cutting as this may result in too aggressive of a cut.**
- **Reaming the head tube deeper than the frame manufacturer's specifications may compromise the structural integrity of the head tube. An improperly reamed head tube may cause frame failure, loss of control of the bicycle while riding, serious injury or death.**

Different materials will behave differently as you cut them. The Chris King facing tool was designed to handle the variance in materials – you do not need to change inserts based on what material you are cutting. In all cases it is good practice to use smooth, even turns on the handle, and to make sure that the frame is being held securely at all times.

1. Choose which headtube opening you'll ream first. These instructions assume that you are starting with the upper opening of the headtube. It does not matter which end of the headtube you ream first, just that you ream both ends.
2. Pass the T handle portion of the tool through the headtube, with the T handle cutting assembly positioned closest to the face that you wish to cut.
3. Pass the clamping mechanism over the end of the threaded shaft, sliding the Guide Cone into the head tube opening. Be sure that the guide cone is properly oriented in the frame before beginning the cut. Failure to do so may cause misaligned frame cutting.
4. The Park™ clamping mechanism uses a clutch or quick release that when depressed allows you to easily position the clamp close to the frame. Draw the mechanism close to (touching) the frame (to the face that is not being machined).
5. Disengage the quick release and draw the tool closer by twisting the mechanism clockwise three or four turns so that it is snug against the headtube.
6. Apply cutting fluid to the area to be cut.

Reaming Step 5: Middle of the Job

Remember to apply cutting fluid often to the area that is being cut.

How to know when to increase the clamping force of the tool: You may find that the reaming head and the tool start to feel "loose" or "wobbly" as you are cutting. You may also experience the tool stopping its advancement through the head tube before the frame bottoms out on the Reamer Stop Plate. This is usually an indication that you need to increase the tension/clamping force of the tool on the frame to draw it closer to the frame material that you are cutting.

How to know if the tool is too tight in the frame: If it is very difficult to start cutting, takes an excessive amount of force to turn the handle or you are removing thick chunks of material, you should loosen the tool.

You will know when you are finished when the Reamer Stop Plate is bottoming out on the face of the head tube and the reamer is not shaving material from the inner diameter of the head tube.

Reaming Step 6: Finishing Up

How to remove the tool from the frame

Never turn the cutting tool counter clockwise, even when removing it from the frame.

1. With one hand depressing the clamping mechinism's quick release, turn the T handle clockwise while pulling upward to extract the cutting head from the headtube bore. You must continue rotating the tool as you remove it from the frame. This will help ensure that the tool's cutting edges remain sharp and will also leave a smoother finish in the bore of the headtube. Pulling the tool out without rotating it may cause premature wear to the cutting edges.

Reaming Step 7: Cleaning up after reaming

1. Use a rag and compressed air to (carefully) remove any chips, shavings, and/or cutting oil from the headtube and cutting tools.
2. Dispose of metal shavings properly. Dispose of cutting fluid appropriately.

Head Tube Facing for InSet™ Headtubes

CHRIS KING®

Facing Step 1: General Project Overview

The King Facing Tool uses 5 indexable, replacable, titanium nitride coated carbide inserts. These are custom made for us, to our specification. Indexable means that when one of the edges gets dull, you just rotate the insert 120° for a fresh cutting edge. Each of the 5 inserts can be replaced without sending the tool anywhere, just order a set of inserts from us and switch them out.

Facing Tolerance:
The recommended tolerance for parallelness of the end faces of the head tube is not to exceed .075mm (.003"). Because facing tolerance is actually more complicated than just having the faces parallel, there is really no accurate way for the average bike shop to measure it. We recommend inking the faces of the head tube with a marker and using the facing tool to see that it removes the ink evenly and completely all the way around. Be sure to use the center guide in the opposing bore to assure alignment. Cut metal as necessary until all of the ink is removed.

Facing Step 2: Prepping the Workspace

Materials Needed for Job

- Park™ Tool HTR-1 or HTR-1B
- Chris King Facing Cutter

- Chris King Reaming and Facing Nut
- Chris King Head Tube Bushing
- Chris King Guide Cone (plus LD Guide Cone Adaptor if facing a 1.5" or 1.5" InSet head tube)
- Heavy duty bicycle workstand
- Chris King soy cutting oil or similar cutting fluid
- Clean rags
- Optional work gloves
- Optional safety glasses
- Optional compressed air (to clean off tool)
- Garbage can (for shavings)
- Sharpie™ marker or black permanent marker
- Deburring/chamfering tool or double-cut half round file

Cautions and Warnings

- A good workstand is necessary for this procedure to secure the bike and make for easier work
- Contact with non-soy based cutting fluid could cause skin irritation. It is a good idea to wear latex gloves when working with it.
- Before using the facing tool, ensure there is sufficient clearance between the cutter head and the down tube by the lower head tube opening.
- It is advised that frame preparation be performed by a trained shop mechanic who is familiar with the procedure. For additional information and videos, showing proper reaming and facing techniques using our tools, please visit our website: http://www.chrisking.com

Facing Step 3: Setting up Frame

1. Secure the frame in the workstand as recommended by the bicycle frame manufacturer.
2. Position the frame so that you can work with the reaming tool at waist height.
3. Use a Sharpie™ marker to mark the faces of the head tube.
4. Place a garbage can underneath the headtube to catch the shavings.

Facing Step 4: Assembling the Tool

Materials Needed for this Procedure

- Park™ Tool HTR-1 or HTR-1B
- Chris King Facing Cutter
- Chris King Reaming and Facing Nut
- Chris King Head Tube Guide Bushing
- Chris King Guide Cone (plus LD Guide Cone Adaptor if facing a 1.5" or 1.5" InSet head tube)

The following section assumes that you already have Chris King reaming tools properly installed on your Park™ T handle. For more information on converting a stock Park™ Tool HTR-1 or HTR-1B T handle tool to the Chris King setup, refer to Reaming Step 3.

Disassembly

1. Remove lower clamping mechanism from threaded T handle shaft.
2. Use wrench to loosen Reaming and Facing Nut and remove nut from shaft
3. Slide off Reaming Cutter and Reamer Stop Plate
4. You should now have a T handle tool with no tools or parts on it.

Assembly

1. Pass the T handle's threaded rod through the Chris King Facing Cutter, the cutter head (the side with the cutting inserts in it) should be facing away from the T handle.
2. Invert the T handle so that the cutter rests on the base of the handle freely (you don't have to hold it in place).
3. Thread on the new Chris King Reaming and Facing Nut, the end with wrench flats should be opposite from the cutter.
4. Tighten the nut firmly against the cutter with a wrench to hold it in place.

5. Select the appropriate Head Tube Bushing for the job at hand. Slide on the LD Guide Cone Adaptor if facing a 1.5" or 1.5" InSet head tube.
6. Pass the Head Tube Bushing over the Reaming and Facing Nut, the bushing will have a tapered or conical end to help guide and center the tool to the center of the bore. Make sure that this end is pointed away from the cutting head. Thread the Head Tube Bushing past the threads on the Reaming and Facing Nut so that it can spin freely on the Nut. It should have a slight ammount of play.
7. Now your facing tool is complete and ready to go.

Facing Step 5: Starting the Job

Cautions and Warnings

- **Always turn the cutting tools in a clockwise direction only. Never turn the tool in a counter clockwise motion, even when pulling the reamer out of the frame. This will damage the cutting edges, comprising cutting sharpness and accuracy.**
- **Reaming and facing are two separate operations. Always perform reaming operations before facing operations. Do not attempt to perform both operations simultaneously as this will yield inconsistent results.**
- **The Park Tool uses spring tension to draw the cutting tools into the frame. Use only enough tension to gently cut material away. It is not necessary to exert a lot of force while cutting as this may result in too aggressive of a cut.**

Different materials will behave differently as you cut them. The Chris King facing tool was designed to handle the variance in materials – you do not need to change inserts based on what material you are cutting. In all cases it is good practice to use smooth, even turns on the handle, and to make sure that the frame is being held securely at all times.

1. Choose which face you'll cut first. These instructions assume that you are starting with the top face of the headtube. It does not matter which end of the headtube you face first, just that you face both ends.
2. Pass the partially assembled tool through the headtube, with the cutting assembly positioned closest to the face that you wish to cut.
3. Pass the clamping mechanism over the end of the threaded shaft.
4. The Park™ cartridge mechanism uses a clutch or quick release that when depressed allows you to easily position the clamp close to the frame. Draw the mechanism close to (touching) the frame (to the face that is not being machined). Be sure that the guide cone is properly oriented in the frame before beginning the cut. Failure to do so may cause misaligned frame cutting.
5. Disengage the quick release and draw the tool closer by twisting the mechanism clockwise three or four turns so that it is snug against the headtube.
6. Apply cutting fluid to the area to be cut.

Facing Step 6: Middle of the Job

Expect to see short chunks of material at the start of the job, long peels towards end.

Remember to apply cutting fluid often to the face that is being cut.

If the tool begins to chatter while it is cutting, it may be because the tool is under insufficient or excessive tension/clamping force.

How to know when to increase the clamping force of the tool: You may find that the facing head and the tool start to feel "loose" or "wobbly" as you are cutting. This is usually an indication that you need to increase the tension/clamping force of the tool on the frame to draw it closer to the frame material that you are cutting. Similarly, if you feel that the tool is just barely grazing the face of the headtube and not cutting it, try increasing the tension on the tool.

How to know when to decrease the clamping force of the tool: If it is very difficult to start cutting, takes an excessive amount of force to turn the handle or you are creating thick chunks of material to be removed, you should loosen the tool.

Facing Step 7: Finishing Up

How do you know when you are finished? One continuous "peel" is generally indicative of a complete facing. However, on some frames (aluminum typically) you may or may not see a continuous peel. It is helpful to refer to your Sharpie™ marking on the face of the headtube to see if all of the material has been removed evenly. Remaining ink will indicate that there are still low spots on the head tube face.

How to remove the tool from the frame.

1. Loosen the clamping mechanism by turning it counter clockwise to relieve spring tension, and then depress the quick release.
2. Lower the Guide Cone well below the headtube.
3. Turn the handle clockwise while pulling upward to extract the cutting head from the headtube face. It is a good idea to continue rotating the tool (with little or no clamping force) as you remove it from the frame. This helps to ensure a smoother finish on the face of the headtube. Pulling the tool out without rotating it will may result in a "step" on the face.

Facing Step 9: Deburring and Filing

Another aspect of frame preparation that is often overlooked is the chamfer on the inside of the head tube bore (top and bottom) and the removal of any sharp edges or burrs. We recommend a chamfer width of .25mm (.010"). A clean chamfer allows the headset cup to be pressed without shaving metal from the headset cup skirt, and allows the headset to sit flat against the tube face without cutting into the small radius in the corner of the cup skirt. A cut in this area of the cup may cause cracks to form over time.

The goal of deburring the edges of the headtube is to remove burrs, not to remove significant amounts of material. Usually, one trip around the inside circumference of the headtube (top and bottom) is sufficient. Carefully remove any sharp edges or burrs and slightly round the inside edges of the head tube at the top and bottom to prevent shearing any metal from the cups during installation.

A deburring or chamfering hand tool is ideal for this operation. In a pinch, a fine double-cut half round file may be carefully used.

Facing Step 10: Cleaning up after facing

1. Use a rag and compressed air to (carefully) remove any chips, shavings, and/or cutting oil from the headtube and cutting tools.
2. Dispose of metal shavings properly. Dispose of cutting fluid appropriately.

Storage and Care of Tool

It is a good idea to visually inspect the facing tool inserts before you put the cutting tools away. The insert edges should appear sharp, even and unscarred.

It is possible to feel burrs on the edges of the inserts – using your fingernail, lightly run down the length of each insert edge. You will feel "catches" or "snags" against your fingernail that are indicative of burrs.

The carbide inserts on the facing tool are "indexable" meaning that you can rotate the insert 120 degrees to attain a fresh cutting edge. If the tool is used frequently on a variety of materials, it is wise to have extra carbide inserts on hand. Those carbide inserts can be ordered from us directly.

Store your reaming and facing tools in a way that will protect the cutting edges from damage and will prevent the bushings and inserts from being marred. Be sure that all cutting edges are protected from contact with other hard surfaces. Never drop the tools, especially onto hard surfaces.

Additional Questions?

For product technical information, refer to our website www.chrisking.com/tech. Additional questions? Please email us at info@chrisking.com or call the Customer Service hotline at 800-823-6008.

Contact information

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