



BONTRAGER
WHEELWORKS AND COMPONENTS

HUB INSTRUCTIONS

HUB INSTRUCTIONS

STANDARD

Front Hubs	
Loose ball	2-3
Loose ball, semi-cartridge; Formula FCM	4-5
Cartridge bearing, alloy axle	6-7
Cartridge bearing, threaded alloy axle	8-9
Rear hubs	
Freehub body information (non-DT Swiss)	11
Loose ball	12-13
Loose ball, double sealed (Formula FCM)	14-15
Cartridge bearing	16-17

DT-SWISS

Comp series hubs	
Introduction	19
Comp front	20-21
Comp rear	22-24
Pro series hubs	
Introduction	25
Pro front	26-27
Pro rear	28-31

Please note: Many sections of this manual must be read in their entirety before performing procedures. In some cases, revised or updated information may be available on the Bontrager wheelworks website at www.bontrager.com. If you cannot find the information you need to service Bontrager wheels, please contact a technical service representative.

Front hubs- Loose ball

Bontrager Superstock, Superstock Disc, Select ATB, Select ATB Disc, Select Road, and Select Hybrid front wheels;
plus Bontrager Comp II front hub



Fig. 1A

Recommended tools

13mm cone wrench
17mm cone wrench
Small slot screwdriver
Hammer (soft faced)

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove external seals (Fig. 2A) with a screwdriver. Be careful not to tear or mar the rubber.

2. On one side (either) of the hub place a 13mm cone wrench on the ball cone. Place a 17mm cone wrench on the end nut (Fig. 3A). Loosen the end nut.

3. Remove the end nut, washer, and ball cone from the axle (Fig. 4A).

4. Slide the axle, with the other end nut, washer, and ball cone still attached, out of the hub (Fig. 4A).

5. Gently insert a thin screwdriver blade under the shell shield (Fig. 5A) and lift to remove the shield from the hub. Pry off the shell shields from both sides of the hub.

6. If inspection shows it necessary, remove the other end nut and ball cone.

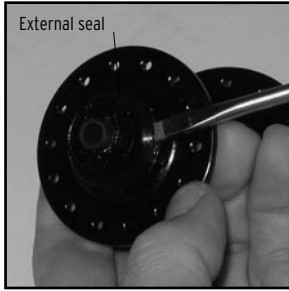


Fig. 2A



Fig. 3A

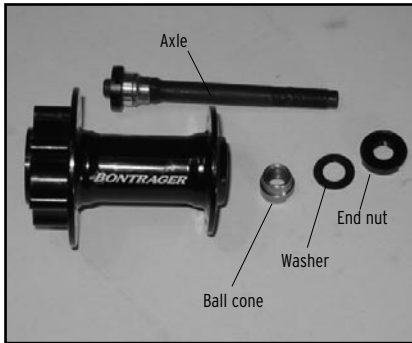


Fig. 4A

Clean and inspect the parts

1. Use solvent to completely remove all old grease and debris from the hub, axle, and axle parts.

2. Inspect the bearing running surfaces of both the ball cones and the ball cups (inside the hub). Replace any cones. If the cups are worn, replace the hub shell.

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.

2. Place a bead of grease all the way around each ball cup, sufficient to hold the balls.

ASSEMBLY

1. Place eleven 3/16" balls in the ball cup on one side of the hub.

2. Place the shell shield, with its sharp edges facing out (Fig. 6A), into the hub. The shell shield is a press fit, so must be tapped lightly to fully seat. Lay a cone wrench over the shell shield and tap the wrench with a hammer (Fig. 7A) to protect the shield and ensure that it is flush with the shell.

3. Repeat Assembly steps 1-2 for the other side of the hub.

4. Tighten the end nut against the ball cone on the axle. Hold the ball cone with a 13mm cone wrench on the axle flats while turning the end nut with a 17mm cone wrench.

5. Insert the axle through the hub from either side.

6. Thread the ball cone, washer, and end nut onto the axle in that order. The serrated surface of the end nut faces out.

7. Hold the ball cone with a 13mm cone wrench and tighten the end nut with a 17mm cone wrench.

8. Check the bearing adjustment by turning the axle with your fingers. The axle should spin smoothly without binding or feeling gritty. There should be no lateral play of the axle in the hub. Readjust the hub as necessary, and re-lock the end nut.

9. Install the external seals, and apply grease where the seals contact the hub shell and axle parts. Make sure the seals properly seal against both the end nut and the hub shell. There should be a smooth transition from seal to sealing surface. An improperly installed seal (Fig. 8A) will allow rapid contamination of the bearings.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

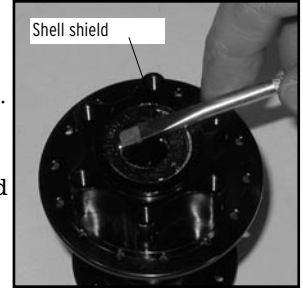


Fig. 5A

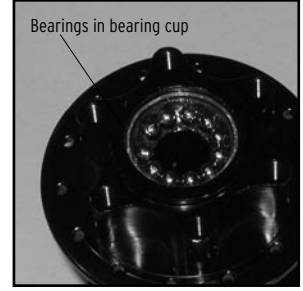


Fig. 6A

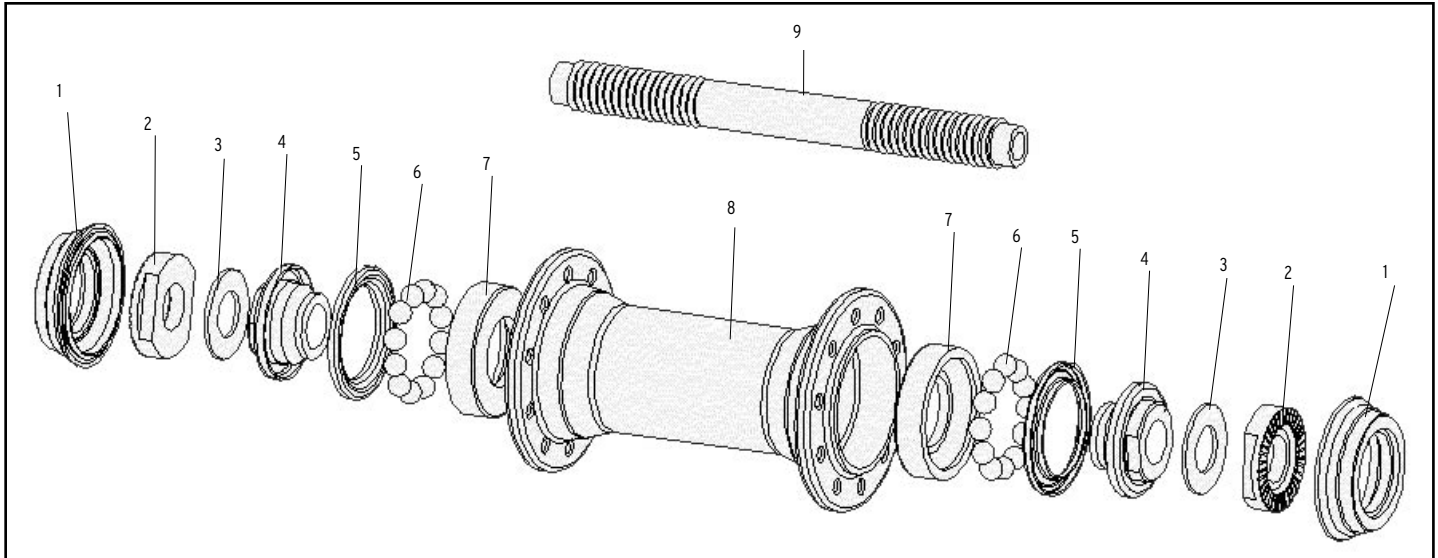


Fig. 7A



Fig. 8A

Exploded view and Parts list



Pos	Description
1	External seal
2	End nut
3	Washer
4	Ball cone
5	Shell shield
6	Ball bearings
7	Ball cup
8	Hub shell
9	Axle

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle set	99/00/01/02	all	1(2), 4(2), 3(2), 9	68257
Locknut set	99/00/01/02	all	2(2)	68543

1999 Bontrager Comp II

O.L.D. 100 mm
 Spoke hole quantity 32°
 Spoke hole P.C.D. 38.0 mm
 Q.R. rod outer diameter 6 mm

2000/2001/2002/2003 Superstock

O.L.D. 100 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D. 38.0 mm
 Q.R. rod outer diameter 5 mm

2002/2003 Superstock Disc, Select ATB Disc

O.L.D. 100 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 58.0 mm
 Q.R. rod outer diameter 5 mm
 Disc rotor spacing 10.5 mm
 Rotor BCD 44.0 mm

2002/2003 Select ATB

O.L.D. 100 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D. 38.0 mm
 Q.R. rod outer diameter 5 mm

2002/2003 Select Road, Hybrid

O.L.D. 100 mm
 Spoke hole quantity 20°
 Spoke hole P.C.D. 38.0 mm
 Q.R. rod outer diameter 5 mm

Front hubs- Loose ball, semi-cartridge; Formula FCM

'99, 2000, 2001 Bontrager Race, Race Disk front wheels



Fig. 1B

Recommended tools

13mm cone wrench
17mm cone wrench
Adjustable wrench
Hammer (soft faced)
Small slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove external seals (Fig. 2B) with a screwdriver. Be careful not to tear or mar the rubber.

2. On one side of the hub (usually left), the cone is locked against a collar on the axle (Fig. 4B). On the other side, place a 13mm cone wrench on the ball cone. Place a 17mm cone wrench on the end nut (Fig. 3B). Loosen the end nut.

3. Remove the end nut, washer, and ball cone from the axle (Fig. 4B).

4. Slide the axle, with the other end nut, washer, and ball cone still attached, out of the hub.

6. Gently insert a thin screwdriver blade between the shell shield (Fig. 5B) and bearing seal (Fig. 6B). Pry off the shell shields from both sides of the hub. Do not attempt to pry off both shield and seal at the same time as you may damage the bearing seal.

7. Gently pry off the bearing seals (Fig. 6B) from both sides of the hub.

8. If inspection shows it necessary, remove the other end nut. Hold the axle by the wrench flats (Fig. 7B) while turning the end nut with a 17mm cone wrench.

Clean and inspect the parts

1. Use solvent to completely remove all old grease and debris from the hub, axle, and axle parts.

2. Inspect the bearing running surfaces of both the ball cones and the ball cups (inside the hub). Replace any worn parts.

Note: If the 'fixed' ball cone is worn, the axle assembly (axle and ball cone) must be replaced.

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.

2. Place a bead of grease all the way around each ball cup, sufficient to hold the balls.

ASSEMBLY

1. Place eleven 3/16" balls in the ball cup on one side of the hub (Fig. 8B).

2. Place the bearing seal, with the lettered side facing out, into the ball cup.

3. Place the shell shield, with its sharp edges facing out, into the hub. The shell shield is a press fit, so must be tapped lightly to fully seat. Lay a cone wrench over the shell shield and tap the wrench with a hammer (Fig. 9B) to protect the shield and ensure that it is flush with the shell.

4. Repeat Assembly steps 1-3 for the other side of the hub.

5. Tighten the end nut against the fixed ball cone (attached to axle). Hold the axle with an adjustable wrench on the axle flats while turning the end nut with a 17mm cone wrench.

6. Insert the axle through the hub from either side.

7. Thread the ball cone, washer, and end nut onto the axle in that order. The serrated surface of the end nut faces out.

8. Hold the ball cone with a 13mm cone wrench and tighten the end nut with a 17mm cone wrench.

9. Check the bearing adjustment by turning the axle with your fingers. The axle should spin smoothly without binding or feeling gritty. There should be no lateral play of the axle in the hub. Readjust the hub as necessary, and re-lock the end nut.

10. Install the external seals. Make sure the seals properly seal against both the end nut and the hub shell. There should be a smooth transition from seal to sealing surface. An improperly installed seal (Fig. 10B) will allow rapid contamination of the bearings.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

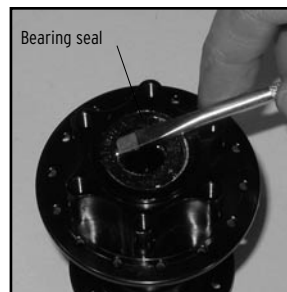


Fig. 6B

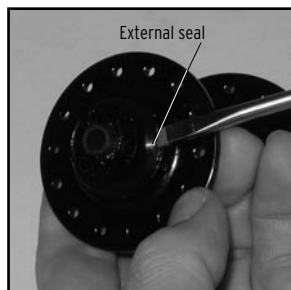


Fig. 2B



Fig. 3B



Fig. 4B

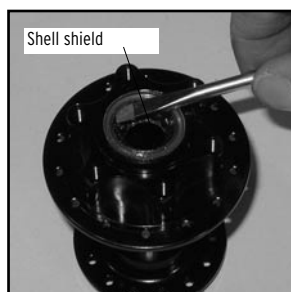


Fig. 5B



Fig. 7B



Fig. 8B

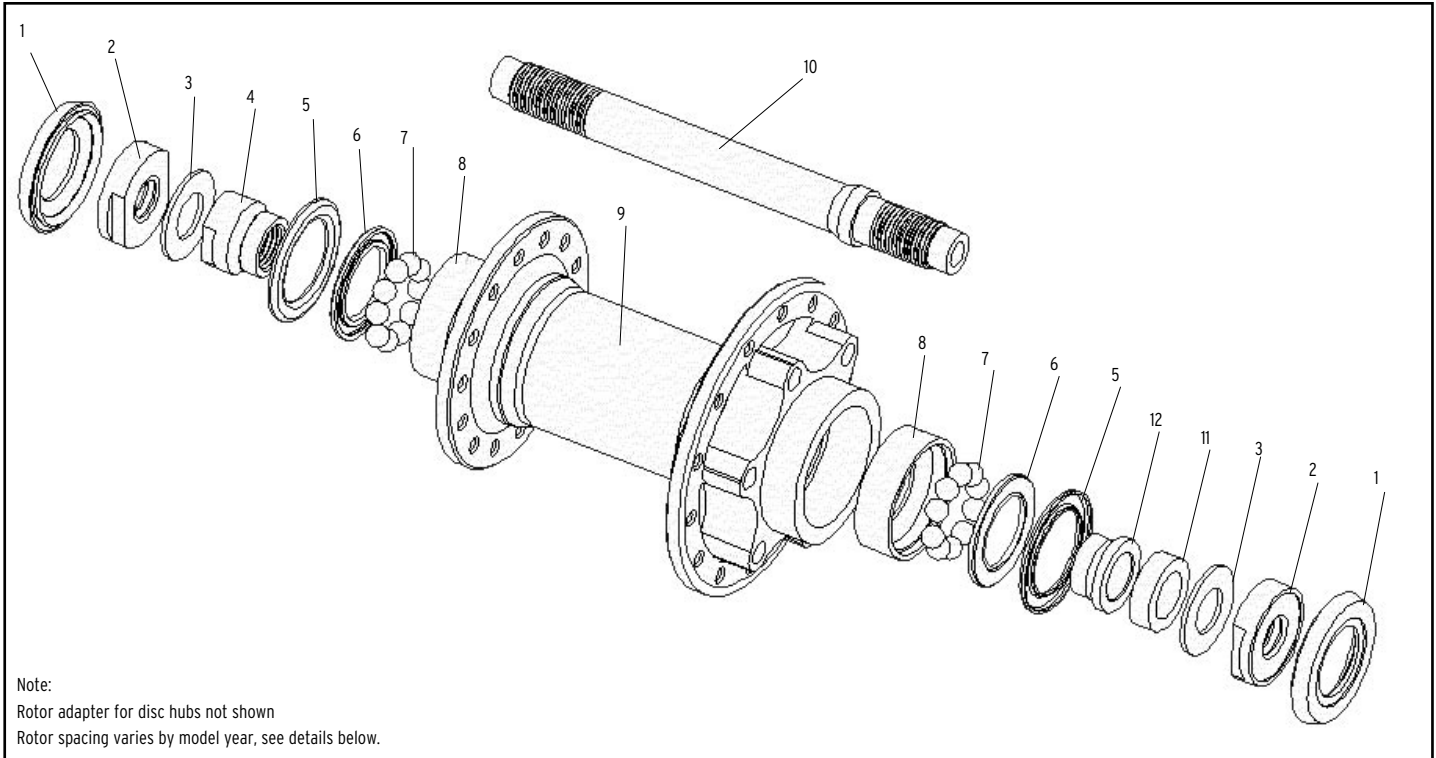


Fig. 9B



Fig. 10B

Exploded view and Parts list



Pos	Description
1	External seal
2	End nut
3	Washer
4	Adjust cone
5	Shell shield
6	Bearing seal
7	Ball bearings
8	Ball cup
9	Hub shell
10	Axle
11	Spacer
12	Ball cone

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle set	99/00/01	all	10, 4, 2, 5(2), 11, 6(2), 3(2)	68524
Locknut set	99/00/01	all	2(2)	68527
Rotor adapter w/screws	99/00	Hayes, RST	Not shown	991083
Disc bolt set	99/00	all	Not shown	991153

1999 Race

O.L.D.	100 mm
Spoke hole quantity	24°
Spoke hole P.C.D.	38.0 mm
Q.R. rod outer diameter	6 mm

1999/2000 Race Disk

O.L.D.	100 mm
Spoke hole quantity	28°
Spoke hole P.C.D., right	45.0 mm
Spoke hole P.C.D., left	58.0 mm
Q.R. rod outer diameter	6 mm
Disc rotor spacing	16.0 mm
Rotor BCD	44.0 mm

2000/2001 Race

O.L.D.	100 mm
Spoke hole quantity	24°
Spoke hole P.C.D.	38.0 mm
Q.R. rod outer diameter	5 mm

2001 Race Disk

O.L.D.	100 mm
Spoke hole quantity	28°
Spoke hole P.C.D., right	45.0 mm
Spoke hole P.C.D., left	58.0 mm
Q.R. rod outer diameter	6 mm
Disc rotor spacing	10.5 mm
Rotor BCD	44.0 mm

Front hubs- Cartridge bearing, alloy axle

2002/2003 Bontrager Race, Race Disc front wheels



Fig. 1C

Recommended tools

17mm cone wrench
Special hook spanner
Hammer and broad punch
Bearing removal tool
Bearing press

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove axle end caps (Fig. 2C) by sliding them out of the axle with your fingers.
2. Hold the axle with a 17mm cone wrench (Fig. 3C) while loosening the axle nut with the special hook spanner (Fig. 4C).
3. Partially unthread the axle nut (Fig. 5C) until it slightly protrudes past the end of the axle.
4. Tap the axle nut with a soft-faced hammer until the axle slides through the opposite bearing. Once loose, the axle should come out with your fingers.
5. Remove the axle nut, and extract the axle (Fig. 6C).
6. Gently insert a thin screwdriver blade between the bearing seal (Fig. 7C) and bearing. Pry off the bearing seals from both sides of the hub.
7. Insert a bearing removal tool into the bearing. Place a blunt punch through the hub and against the bearing removal tool. Tap the punch with the hammer to drive the bearing out of the hub (Fig. 8C). Repeat for the other bearing.

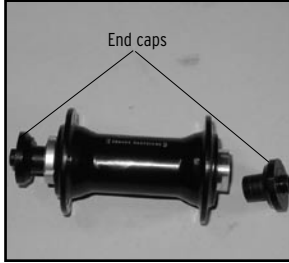


Fig. 2C



Fig. 3C

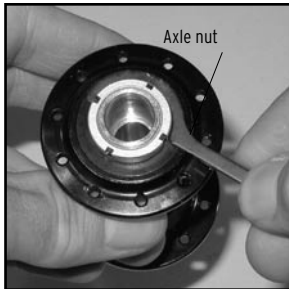


Fig. 4C

Clean and inspect the parts

1. Wipe old grease or debris from the hub bearing seats.
2. Normally, bearings are not re-used. If you are re-installing an old bearing, wipe off any grease or debris from both the inner and outer surfaces.

Do not use solvent on the bearing, as the solvent will contaminate the grease. This may cause bearing failure.

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.
2. Lightly grease the inner and outer surfaces of each bearing.

ASSEMBLY

1. Press a bearing into the hub with a bearing press.
Note: the black seal faces out (Fig. 9C).
2. Press the second bearing with the bearing press.
3. Place the bearing seals into the hub with the lettered surface facing out.
6. Insert the axle through the hub from either side.
7. Thread the axle nut onto the axle.
8. Hold the axle with a 17mm cone wrench and tighten the axle nut with the special hook spanner until finger tight.
Do not over-tighten the axle nut. The axle should turn freely with no lateral play in the hub shell.
9. Press the axle end caps into both ends of the axle.
After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

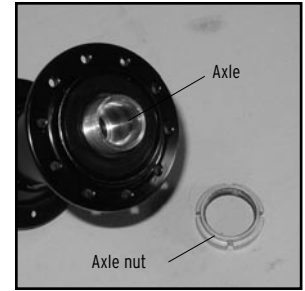


Fig. 5C



Fig. 6C

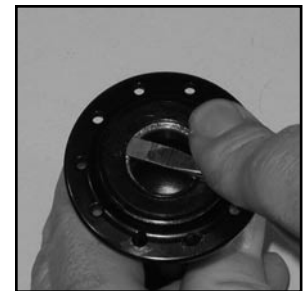


Fig. 7C

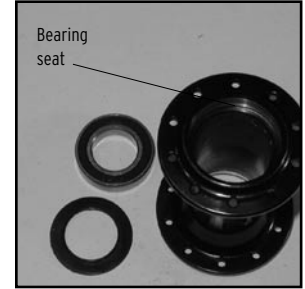


Fig. 8C

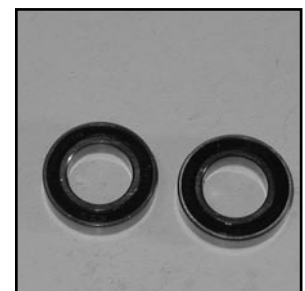
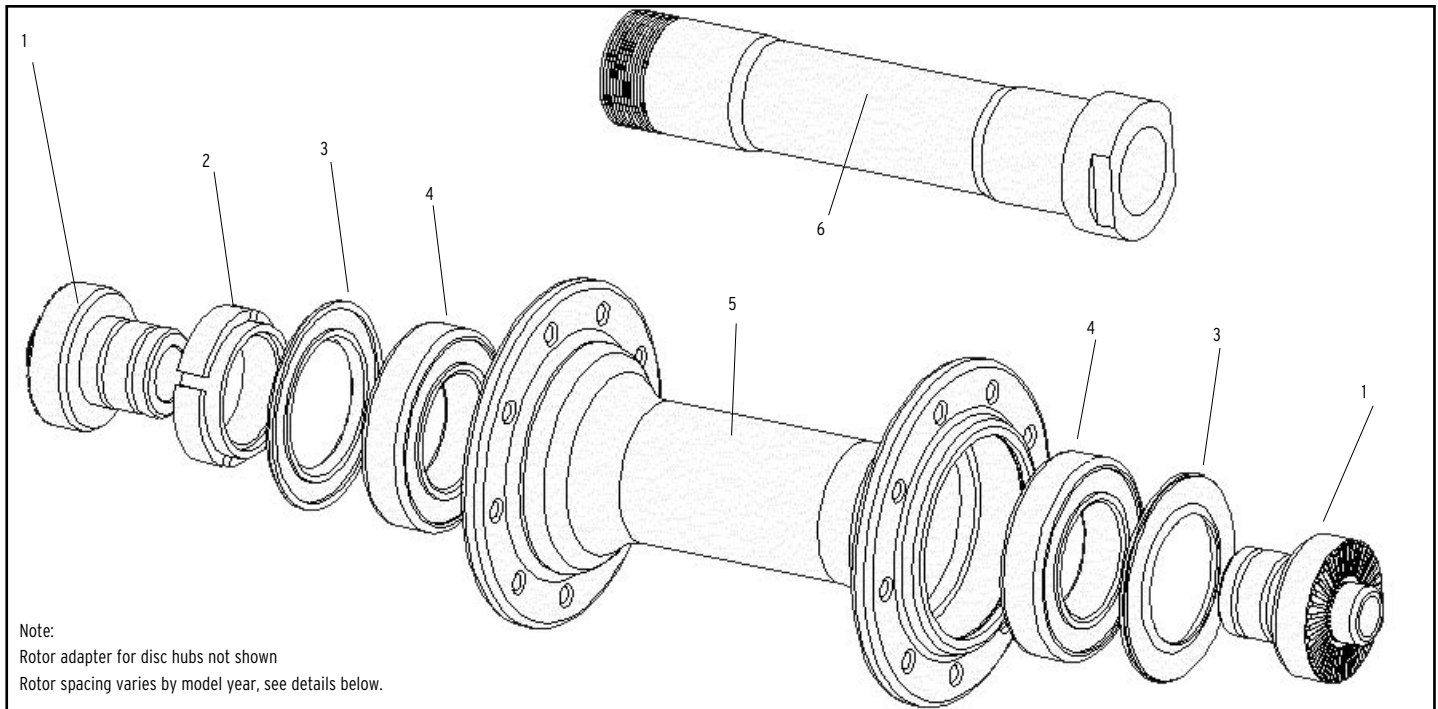


Fig. 9C

Exploded view and Parts list



Pos	Description
1	End cap
2	Adjustable nut
3	Seal
4	Bearing
5	Hub shell
6	Axle

Description	Model year	Model for	Parts included (qty)	TCG Part #
Seal	99/00/01	all	3(2)	68261
Bearing #6903	99/00/01	all	4(2)	68262
Axle set	99/00/01	all	6, 4(2)	68263
Adjustable nut	99/00/01	all	2	68264
End cap, 20.5mm O..D.	99/00/01/02	all	1(2)	211645
Rotor adapter w/screws	99/00	Hayes, RST	Not shown	991083
Disc bolt set	99/00	all	Not shown	991153
Special hook spanner	99/00/01/02	all	Not shown, see Fig. 4C	68259

2002 Race

O.L.D. 100 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D. 42.0 mm
 Q.R. rod outer diameter 5 mm

2002 Race Disk

O.L.D. 100 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D., right 45.0 mm
 Spoke hole P.C.D., left 58.0 mm
 Q.R. rod outer diameter 5 mm
 Disc rotor spacing 10.5 mm
 Rotor BCD 44.0 mm

Front hubs- Cartridge bearing, threaded alloy axle

2002/2003 Bontrager Race Lite Road front wheels



Fig. 1H

Recommended tools

17mm cone wrench (2)
Hammer and broad punch
Bearing press

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove one of the threaded axle end caps (Fig. 2H) by loosening with the pair of 17mm cone wrenches.

2. With one end cap removed, drive the axle from the hub shell with a soft-faced hammer.

3. Place a broad punch through the hub, and tap the punch with a hammer to drive the second bearing (Fig. 3H), with its seal, from the hub.

4. If needed, remove the second bearing from the axle. To do this, clamp the middle of the axle, loosen the end cap, and remove it. Support the bearing and tap the axle out with a soft-faced hammer.

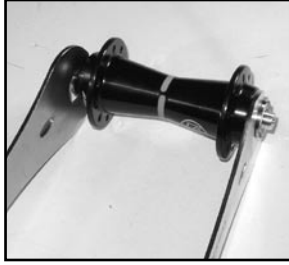


Fig. 2H

Clean and inspect the parts

1. Wipe old grease or debris from the hub bearing seats.

2. Normally, bearings are not re-used. If you are re-installing an old bearing, wipe off any grease or debris from both the inner and outer surfaces.

Do not use solvent on the bearing, as the solvent will contaminate the grease. This may cause bearing failure.

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.

2. Lightly grease the inner and outer surfaces of each bearing.

ASSEMBLY

1. Press a new bearing onto the axle with a bearing press.

Note: the black seal faces out (Fig. 4H).

2. Place the hub seal onto the axle, and thread on the axle end cap. Clamp the middle of the axle and tighten the axle end cap with the 17mm cone wrench.

3. Press the bearing, with the axle attached, into the hub.

4. Press the second bearing into the hub.

Note: the black seal faces out (Fig. 4H).

5. Place the hub seal over the bearing, and press into the hub shell.

6. Thread on the second axle end cap, and tighten with the 17mm cone wrench.

Do not over-tighten the axle nut. The axle should turn freely with no lateral play in the hub shell.

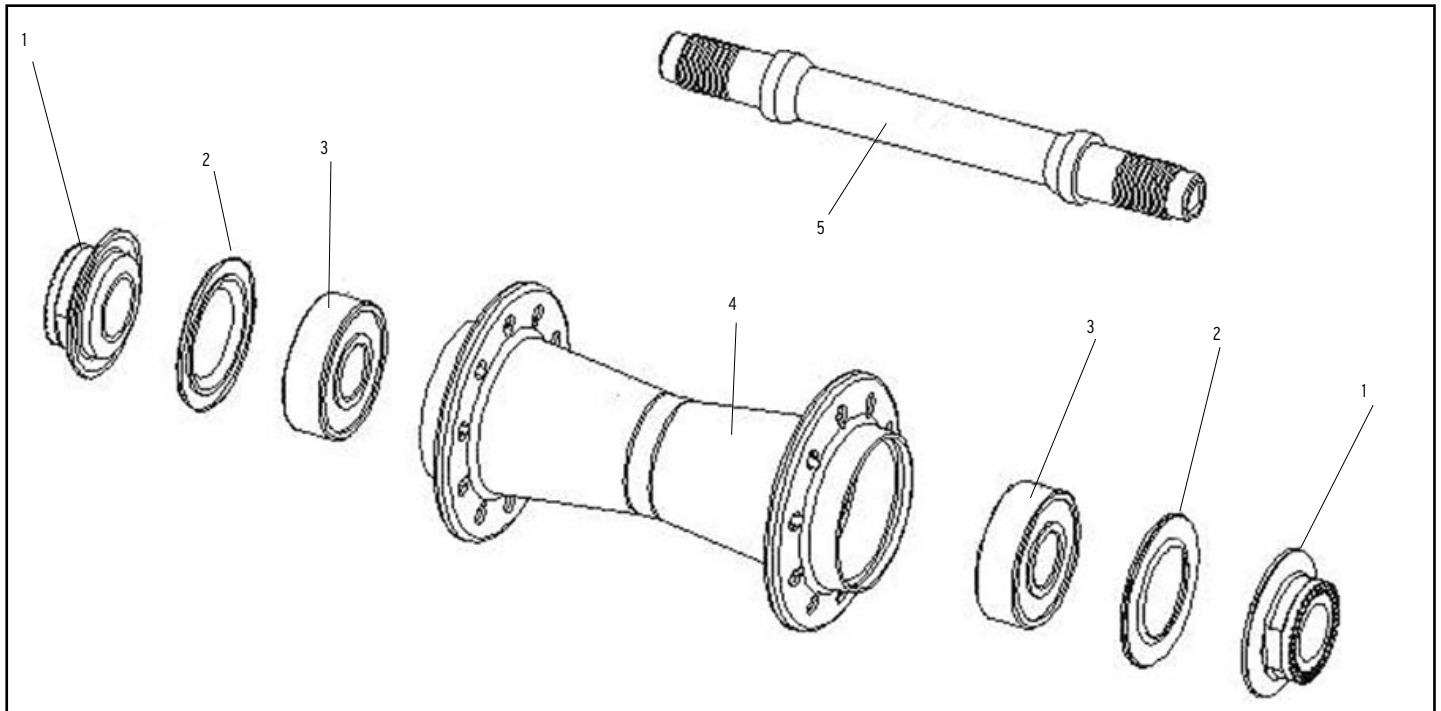


Fig. 4H



Fig. 3H

Exploded view and Parts list



Pos	Description
1	End nut
2	Seal
3	Bearing
4	Hub shell
5	Axle

Description	Model year	Model for	Parts included (qty)	TCG Part #
Seal	02	all	2(2)	221468
Bearing #6000	02	all	3(2)	73335
Axle set	02	all	1(2), 2(2), 3(2), 5	221470
End nut	02	all	1(2)	221467
Axle	02	all	5	221469

2002/2003 Race Lite Road

O.L.D. 100 mm
 Spoke hole quantity 20°
 Spoke hole P.C.D. 38.0 mm
 Q.R. rod outer diameter 5 mm

Freehub body information (non-DT Swiss)

FREEHUB BODY RUNNING CHANGE

Bontrager rear hubs use an unique freehub body that in some cases has encountered removal issues. In these cases, a high amount of torque is necessary to remove or install the freehub body attachment bolt.

To resolve this problem a running change was made to the 2001 product line. The older, direct contact style of freehub body has been replaced with a splined freehub body attachment. This splined attachment requires less bolt torque. Since it is a running change, the following information is necessary to identify which freehub body is on a wheel.

If there is a date code stamped on the freehub body it probably uses a splined attachment. If there is no date, it is a threaded attachment. After May 2000, both styles of freehub bodies (both attachment types) will have this date mark.

These different styles of freehub bodies are not interchangeable.

Identification of freehub bodies

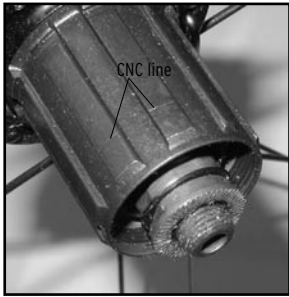


Fig. 1

Threaded freehub body

With the older, threaded freehub body, there are two identifiers. First, there is a CNC machine line approximately 10mm from the outside end of the freehub body (Fig. 1). Second, the thread-attached freehub body is designed to be removed with a 12mm allen wrench.



Fig. 2

Splined freehub body

The newer, splined attachment (Fig. 2) freehub body has no CNC line. Further, it is designed to use an 11mm allen wrench for removal. A special adapter (TCG #211338) is made which attaches to an 8mm allen wrench to fit the 11mm allen head of the freehub attachment bolt (Fig. 3).



Fig. 3

In addition, as a running change the new hub bodies will include a 6-digit part number embossed on the outside of the hub shell where it is plainly visible. All hubs with the part number visible use the splined freehub body.

INSTALLATION AND REMOVAL

If the freehub body is worn or damaged, replace it.

Removing the freehub body

1. Follow the Disassembly instructions for the hub. Remove the axle, and then the right side bearings.
2. Determine the correct size of allen wrench to engage the freehub body attachment bolt.
3. Unthread the bolt in a counter-clockwise direction (standard threading).



Fig. 4

Installing the freehub body

1. Carefully clean the mating surfaces and threads of the freehub body, hub shell, and attachment bolt.
2. Lubricate the threads of the attachment bolt with Wrench Force™ synthetic grease, or a similar product.
3. Carefully engage the threads of the freehub body attachment bolt into the hub shell. The bolt is steel, and the hub is aluminum, so cross-threading the bolt will result in destruction of the hub shell.
4. With the new splined freehub engagement, make sure the splines are aligned as you tighten the attachment bolt.

For the older, threaded style freehub body, tighten the freehub attachment bolt to 350 lb•in (40Nm).

For the newer, splined design, tighten the freehub attachment bolt to 400 lb•in (45.2 Nm).

Description	TCG Part #
Freehub tool, 11mm adapter	211338

Rear hubs- Loose ball

Bontrager Superstock, Superstock Disc, Select ATB, Select Road, Select Hybrid wheels, plus Bontrager Comp II rear hub



Fig. 1D

Recommended tools

(2) 15mm cone wrench
Adjustable wrench
Hammer (soft faced)
Small slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove external seals with your fingers or a screwdriver (Fig. 2D). Be careful not to tear or mar the rubber.

2. On the left side (non-drive) of the hub place a 15mm cone wrench on the ball cone. Place a 15mm cone wrench on the end nut (Fig. 3D). Loosen the end nut.

4. Remove the end nut, large washer, spacer, small washer, and ball cone from the axle (Fig. 4D).

5. Slide the axle, with the other end nut, washer, and ball cone still attached, out of the hub.

6. Insert a thin screwdriver blade under the shell shield (Fig. 5D) and pry off the shell shield from the left side of the hub.

8. If inspection shows it necessary, remove the ball cone, washers, and end nut from the right side of the axle.

9. Remove the ball bearings (Fig. 6D) from both sides of the hub.

10. If it is necessary to remove the freehub body, refer to the Freehub Body section, pages Freehub 1 and Freehub 2, for

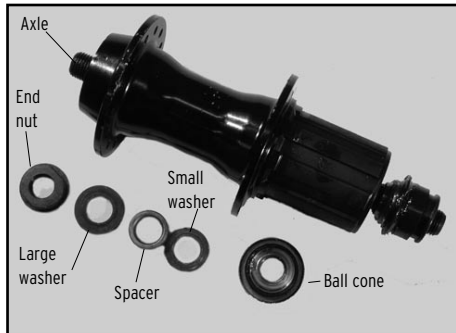


Fig. 4D

removal and installation instructions.

When overhauling the hub bearings, it is usually not necessary to remove the freehub body.

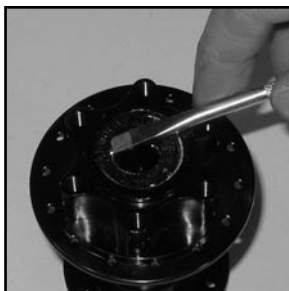


Fig. 5D

Clean and inspect the parts

1. Use solvent to completely remove all old grease and debris from the hub, axle, and axle parts. Avoid getting solvent into the freehub, and be sure to remove all solvent thoroughly before proceeding.

2. Inspect the bearing running surfaces of both the ball cones and the ball cups (inside

the hub). Replace any worn parts.

ASSEMBLY

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.

2. Place a bead of grease all the way around each ball cup, sufficient to hold the balls.

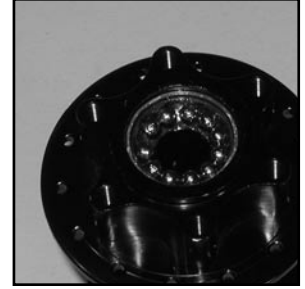


Fig. 6D

Assemble the hub

1. Place nine 1/4" balls in the ball cup on one side of the hub (Fig. 6D).

2. Place the shell shield, with its sharp edges facing out, into the hub. The shell shield is a press fit, so must be tapped lightly to fully seat. Lay a cone wrench over the shell shield and tap the wrench with a hammer (Fig. 7D) to protect the shield and ensure that it is flush with the shell.

3. Repeat Assembly steps 1-2 for the other side of the hub.

4. Tighten the end nut against the fixed ball cone (attached to axle) by holding the ball cone with a 15mm cone wrench and turn the end nut with another 15mm cone wrench.

5. Insert the axle through the hub from the right hand (drive) side.

7. Thread the ball cone, small washer, spacer, large washer, and end nut onto the axle in that order. The serrated surface of the end nut faces out.

8. From the left side of the hub, hold the ball cone with a 15mm cone wrench and tighten the end nut with a 15mm cone wrench.

9. Check the bearing adjustment by turning the axle with your fingers. The axle should spin smoothly without binding or feeling gritty. There should be no lateral play of the axle in the hub. Readjust the hub as necessary, and re-lock the end nut.

10. Install the external seal. Make sure the seal properly seals against both the end nut and the hub shell. There should be a smooth transition from seal to sealing surface. An improperly installed seal (Fig. 8D) will allow rapid contamination of the bearings.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

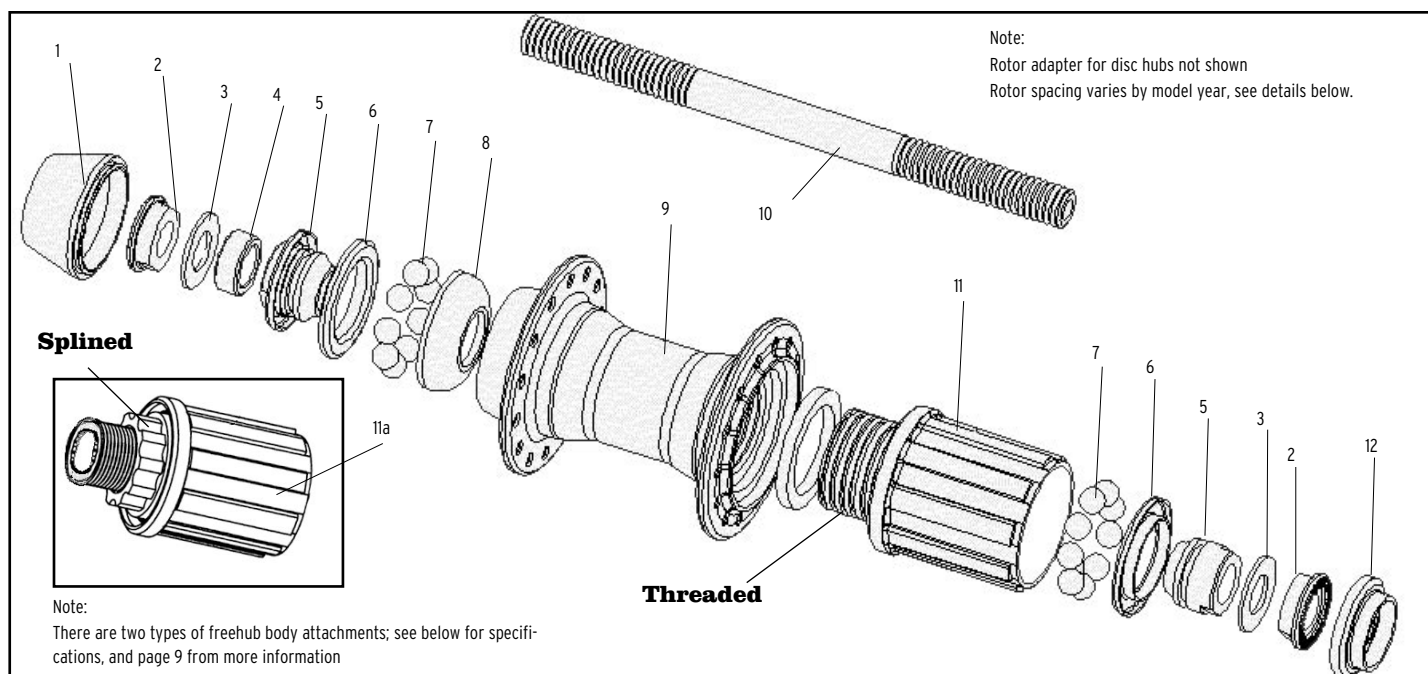


Fig. 7D



Fig. 8D

Exploded view and Parts list



Pos	Description
1	External seal
2	End nut
3	Washer
4	Spacer
5	Ball cone
6	Shell shield
7	Bearings
8	Ball cup
9	Hub shell
10	Axle
11	Freehub body
12	Cone seal

Description	Model year	Model for	Parts included (qty)	TCG Part #
Washer	99/00/01/02	all	3	990008
Freehub body, threaded	99/00	all	11, 6	68541
Freehub body, splined	01/02	all	11a, 6, removal tool	211341
Rotor adapter	99/00	Hayes, RST rear	Not shown	991075
Rotor adapter	99/00	Magura Gustav, Louise rear	Not shown	69156
Axle set	99/00/01	all road, 130mm	2, 3, 4, 5(2), 10	68542
Axle set	99/00/01	all atb, 135mm	2, 3, 4, 5(2), 10	68531
Disc bolt set	99/00		Not shown	991153

1999 Bontrager Comp II

O.L.D. 135 mm
 Spoke hole quantity 32°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment threaded

2001/2002 Bontrager Superstock

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment running change

2002/2003 Bontrager Superstock Disc, Select ATB Disc

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 58.0 mm
 Disc rotor spacing 15.25 mm
 Rotor BCD 44.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

2002/2003 Bontrager Superstock

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

2002/2003 Bontrager Select ATB

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

2002/2003 Bontrager Select Road

O.L.D. 130 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

2002/2003 Bontrager Select Hybrid

O.L.D. 135 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D. 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

Rear hubs- Loose ball, double sealed (Formula FCM)

'99, 2000, 2001 Bontrager Race and Race Disk rear wheels



Fig. 1E

Recommended tools

(2) 15mm cone wrench
12mm allen wrench
Adjustable wrench
Hammer
Small slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

Remove the axle

1. Remove external seals (Fig. 2E) with your fingers or a screwdriver. Be careful not to tear or mar the rubber.
2. On the left side (non-drive) of the hub place a 15mm cone wrench on the bearing cone (Fig. 3E).
3. Place a 15mm cone wrench on the end nut (Fig. 4E). Loosen the end nut.
4. Remove the end nut, large washer, spacer, small washer, and cone from the axle (Fig. 4E).
5. Slide the axle (Fig. 4E), with the other end nut, washer, and cone still attached, out of the hub.
6. Insert a thin screwdriver blade under the shell shield (Fig. 5E) and pry off the shell shields from both sides of the hub.

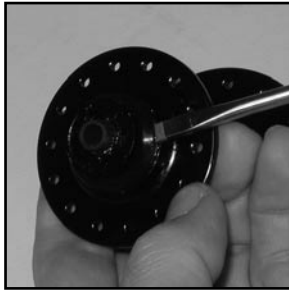


Fig. 2E



Fig. 3E

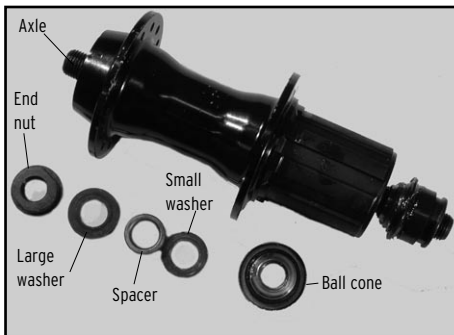


Fig. 4E

8. If inspection shows it necessary, remove the cone, washers, and end nut from the right side of the axle.

9. Remove the ball bearings (Fig. 6E) from both sides of the hub.

7. If it is necessary to remove

the freehub body, refer to the Freehub Body section, pages Freehub 1 and Freehub 2, for removal and installation instructions.

When overhauling the hub bearings, it is usually not necessary to remove the freehub body.

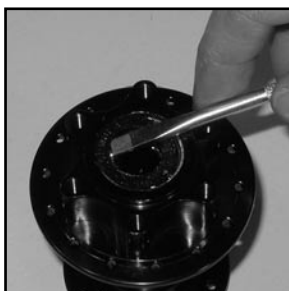


Fig. 5E

Clean and inspect the parts

1. Use solvent to completely remove all old grease and debris from the hub, axle, and axle parts.
2. Inspect the bearing running surfaces of both the cones and the ball cups (inside the hub). Replace any worn parts.

ASSEMBLY

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.
2. Place a bead of grease all the way around each ball cup, sufficient to hold the balls.



Fig. 6E

Assemble the hub

1. Place nine 1/4" balls in the ball cup on one side of the hub (Fig. 6E).
2. Place the shell shield, with its sharp edges facing out (Fig. 6E), into the hub. The shell shield is a press fit, so must be tapped lightly to fully seat (Fig. 7E). Lay a cone wrench over the shell shield and tap the wrench with a hammer to protect the shield and ensure that it is flush with the shell.
3. Repeat steps 1-2 for the other side of the hub.
4. Tighten the end nut against the fixed cone (attached to axle) by holding the cone with a 15mm cone wrench and turn the end nut with another 15mm cone wrench.



Fig. 7E



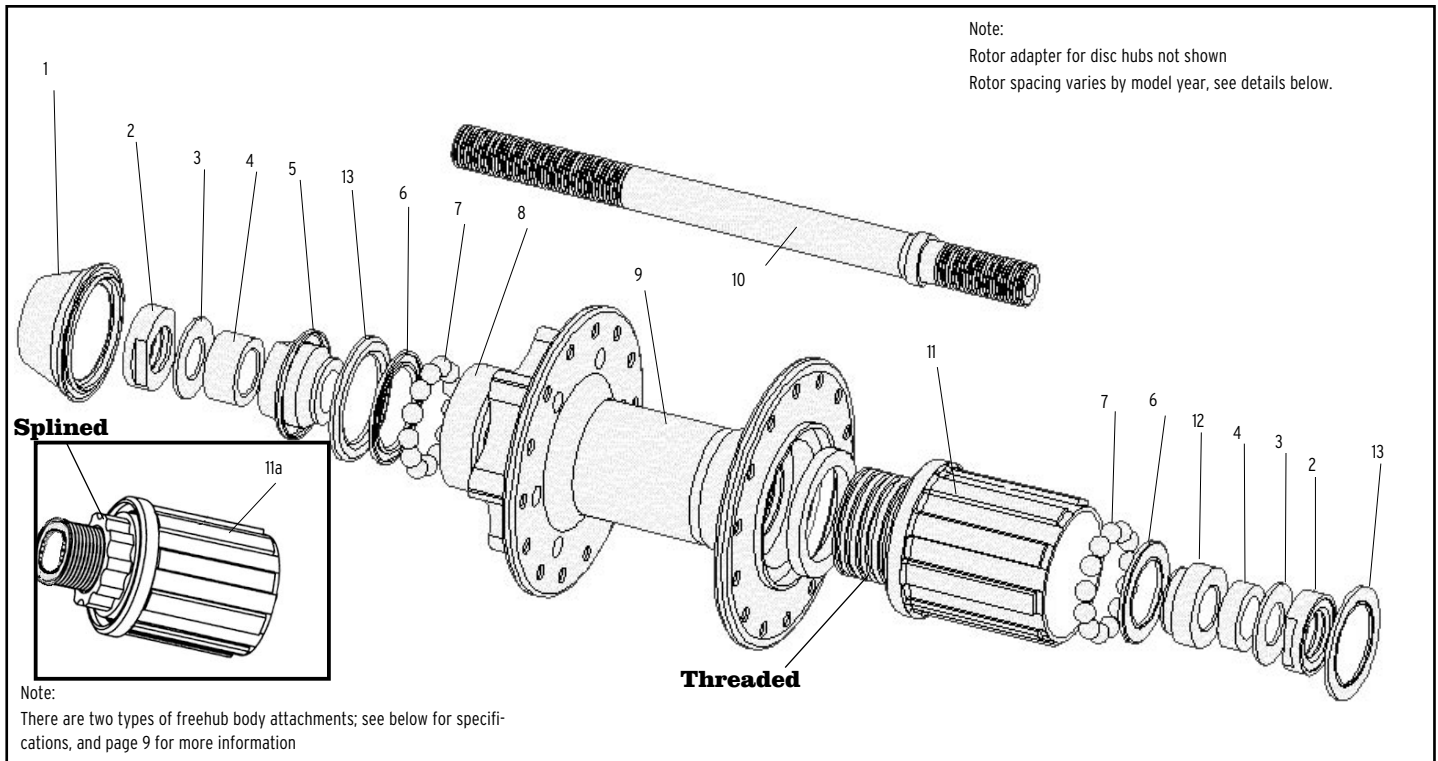
Fig. 8E

5. Insert the axle through the hub from the right hand (drive) side.
7. Thread the cone, small washer, spacer, large washer, and end nut onto the axle in that order. The serrated surface of the end nut faces out.
8. From the left side of the hub, hold the cone with a 15mm cone wrench and tighten the end nut with a 15mm cone wrench.
9. Check the bearing adjustment by turning the axle with your fingers. The axle should spin smoothly without binding or feeling gritty. There should be no lateral play of the axle in the hub. Readjust the hub as necessary, and re-lock the end nut.

10. Install the external seal. Make sure the seal properly seals against both the end nut and the hub shell. There should be a smooth transition from seal to sealing surface. An improperly installed seal (Fig. 8E) will allow rapid contamination of the bearings.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

Exploded view and Parts list



Pos	Description
1	External seal
2	End nut
3	Washer
4	Spacer
5	Adj. cone
6	Shell shield
7	Bearings
8	Ball cup
9	Hub shell
10	Axle
11	Freehub body
12	Ball cone
13	Cone seal

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle set	99/00	all	10	68533
End nut set	99/00	all	2(2)	68536
External seal, yellow	99/00	all	1, 13	68534
External seal, red	99/00	all	1, 13	68535
Freehub body, threaded	99/00	all	11	68540
Freehub body splined	01	all	11a, 6, removal tool	211340
Rotor adapter	99/00	Hayes, RST rear	Not shown	991075
Rotor adapter	99/00	Magura Gustav, Louise rear	Not shown	69156
Disc bolt set	99/00	all	Not shown	991153

2000 Race

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D., right 58.0 mm
 Spoke hole P.C.D., left 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment threaded

2000 Race Disk

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 58.0 mm
 Disc rotor spacing 19.9 mm
 Rotor BCD 44.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment threaded

2001 Race

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D., right 58.0 mm
 Spoke hole P.C.D., left 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment running change

2001 Race Disk

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 58.0 mm
 Disc rotor spacing 15.25 mm
 Rotor BCD 44.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment running change

Rear hub- Cartridge bearing

2002/2003 Bontrager Race, Race Disc rear wheels



Fig. 1F

Recommended tools

15mm cone wrench
19mm cone wrench
Small slot screwdriver
Hammer (soft faced)
Cartridge bearing remover
Bearing press

DISASSEMBLY

Hub parts and names are referenced on next page.

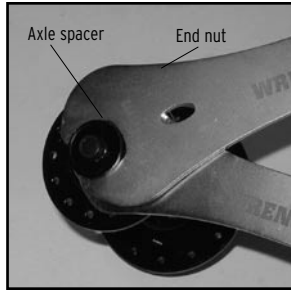


Fig. 2F

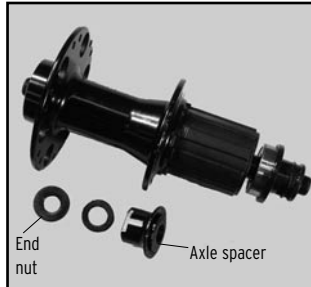


Fig. 3F

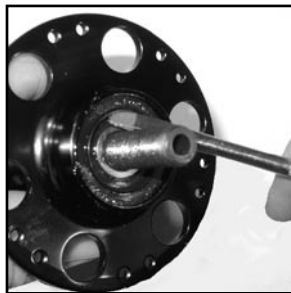


Fig. 4F

1. Hold the left side (non-drive) axle spacer with a 19mm cone wrench and loosen the end nut (Fig. 2F) with a 15mm cone wrench.

2. Remove the end nut, washer, and axle spacer (Fig. 3F) from the axle.

3. Insert a thin screwdriver blade under the bearing seal (Fig. 4F) and pry off the seals from both sides of the hub.

4. Tap the left end of the axle with a hammer to drive the axle out of the hub.

5. If inspection shows it necessary, remove the washers and end nut from the right side of the axle.

To loosen the end nut, re-install the left side axle spacer and locknut, and lock the end nut against the axle spacer. Hold the axle spacer with a cone wrench while you loosen the right side end nut. Alternately, hold the axle with vise grips.

6. Place a bearing removal tool on the left bearing. With a punch on the bearing tool, drive the left bearing out of the hub with a hammer.

7. If it is necessary to remove the freehub body, refer to the Freehub Body section, pages Freehub 1 and Freehub 2, for removal and installation instructions.

When overhauling the hub bearings, it is usually not necessary to remove the freehub body.

Clean and inspect the parts

1. Wipe old grease or debris from the hub bearing seats.

2. Normally, bearings are not re-used. If you are re-installing an old bearing, wipe off any grease or debris from both the inner and out surfaces.

Do not use solvent on the bearing, as the solvent will contaminate the grease. This may cause bearing failure.

ASSEMBLY

Lubricate bearings and threads

1. Lubricate the threads on the axle with Wrench Force™ synthetic grease, or a similar product.

2. Lightly grease the inner and outer surfaces of each bearing where they contact the hub shell and axle.

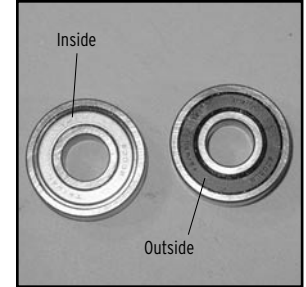


Fig. 5F

Assemble the hub

1. Press the right bearing onto the right side of the axle, denoted by the smooth, non-threaded area with a shoulder.

Note: the black seal of the bearing faces out (Fig. 5F).

2. Place the axle through the freehub body.

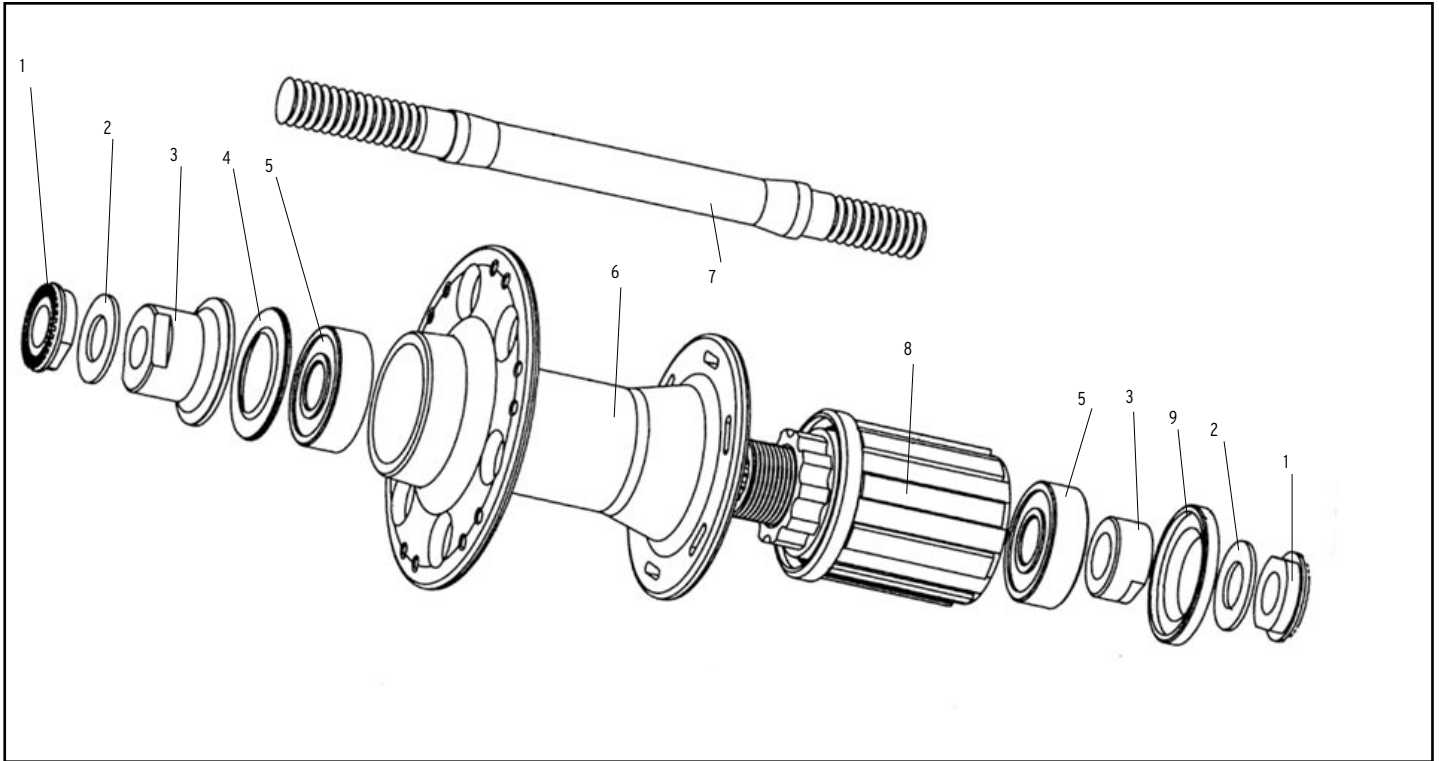
3. Press the bearing into the hub shell with the bearing press.

4. Slide the left bearing onto the axle with the black seal facing out. Thread the axle spacer onto the axle, and use the bearing press to press the left bearing into the hub. The axle should turn freely with no lateral play in the hub shell.

5. Place the bearing seals into the hub with the lettered surface facing out.

6. Thread the axle spacer onto the axle. Place a 17mm cone wrench on the axle spacer and a 15mm cone wrench on the end nut. Tighten the end nut against the axle spacer. After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

Exploded view and Parts list



Pos	Description
1	End nut
2	Washer
3	Spacer
4	Seal
5	Bearings
6	Hub shell
7	Axle
8	Freehub body
9	Freehub seal

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle set	01/02	all	1(2), 2(2), 3(2), 4, 7, 9	211351
Bearing	01/02	all	5	73335
Freehub body splined	01/02	all	8, 9, removal tool	211339
Bearing press	01/02	all	DT Comp/Onyx (not shown) DT Pro/240 (not shown)	211416 211415
Removal tool			Not shown	211338

2002/2003 Race

O.L.D. 135 mm
 Spoke hole quantity 28°
 Cassette body type Shimano 8/9 speed
 Spoke hole P.C.D., right 58.0 mm
 Spoke hole P.C.D., left 45.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

2002/2003 Race Disc

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D. 58.0 mm
 Disc rotor spacing 15.25 mm
 Rotor BCD 44.0 mm
 Cassette body type Shimano 8/9 speed
 Cassette body attachment splined

DT-Swiss Comp series hubs

Important information before you begin with Comp series hubs

Some Bontrager front hubs utilize DT Swiss internal parts. This manual is intended for retailers with the appropriate skills and knowledge to work on these hubs. Please read the entire section before carrying out any kind of maintenance work.

This manual details the principle design features of DT Swiss front hubs and also provides instructions as to maintenance and repair work. Please take special care to use only original DT Swiss special tools in order to undertake the work details in this manual. Use only DT Swiss replacement parts.

In this manual, the hubs are shown installed in a complete wheel. Maintenance work should be carried out on complete wheels where possible. Otherwise, some steps can not be carried out correctly.

This manual provides technical and spare parts information for these hubs. If you have further questions about these hubs regarding technical information, support, or warranty, they should be directed to Bontrager Technical Support via phone or on the Bontrager web site at www.bontrager.com.

In the event of improper servicing of the hubs, Bontrager has the right to refuse any warranty.

Special information before you begin

Bearing resistance: New or newly re-built hubs have a higher rolling resistance than used hubs because the grease in the freehub has not yet been evenly distributed and the seals have not yet bedded in.

Check your work: Before use, always check the hub for proper functioning.

Regular Maintenance

Maintenance of the front hubs should be performed at least once a year. This maintenance schedule is based on normal usage. If you ride your bike more than average, or in rain, snow, or off road conditions, service your bicycle more often than the schedule suggests. If any part appears to be malfunctioning, inspect and service it immediately.

Things to avoid

Avoid high pressure washing systems, like those at most car washes. The high pressure can bypass bearing seals, letting water into the bearings. Do not use any kind of solvents or tensides- this can damage the hub.

Tool list for DT Swiss front hubs

The following tools may be necessary to perform maintenance work on DT Swiss Comp series hubs:

Long bearing press

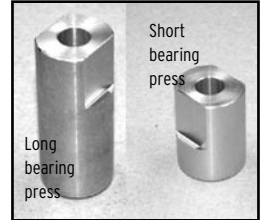
Short bearing press

DT 17mm cone wrench

Comp front hub bearing press

Multi-purpose DT grease

These maintenance items are available as TCG part #211416.



Comp front hub

Bontrager Race Modified, Race Modified Disc front wheel, 2003 Race Lite ATB, Race Lite ATB Disc front wheel



Fig. 1K

Recommended tools

Comp bearing press, front hub
Short bearing press
17mm cone wrench
Multi-purpose grease
Bench vise
Axle vise
Hammer, soft faced
Thin-bladed slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

Disassemble the hub

1. Tap the axle (either end) with the hammer until the axle is flush with the surface of the end cap.
2. Remove the opposite end cap (Fig. 1K).
3. Tap the axle end without the end cap with the hammer (Fig. 2K) and remove the axle.
4. Slide the end cap, seal, and bearing from the axle (Fig. 3K).
5. Re-insert the axle through the hub and tap out the second bearing.

Clean and inspect the parts

Thoroughly clean and inspect all components with a dry cloth. If cracks or any other damage is visible, replace the part.



Fig. 2K



Fig. 3K

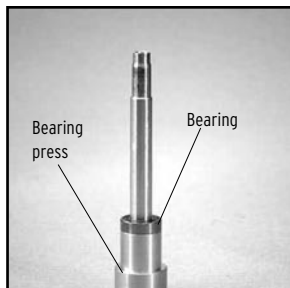


Fig. 4K

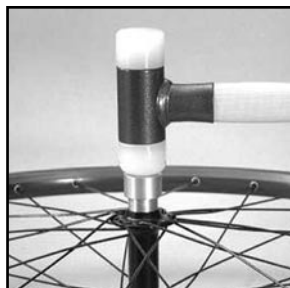


Fig. 5K

ASSEMBLY

1. Place the Comp bearing press on the workbench or other solid surface. Push a new bearing onto the axle, and push the axle into the bearing press (Fig. 4K).

2. Place the hub over the axle.

3. Place the second Comp bearing press over the axle. Tap the upper bearing press with the hammer (Fig. 5K) to press the bearing into the hub.

4. Remove the upper bearing press.

5. Pull the axle out about 10mm (3/8in). Press the second bearing over the axle (Fig. 6K).

6. Place the second bearing press over the axle. Tap the upper bearing press with the hammer (Fig. 7K) to press the second bearing into the hub. Check the bearing installation by spinning the axle. It should rotate freely without irregular friction.

7. Lightly grease the surface of both bearings.

8. Pull the V-seal off the end cap (Fig. 8K). Clean it thoroughly with a cloth, lightly grease it, and reinstall it on the end cap with the open 'V' facing the hub.

9. Position the completed end cap over the axle, and press into place with your fingers.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.



Fig. 6K

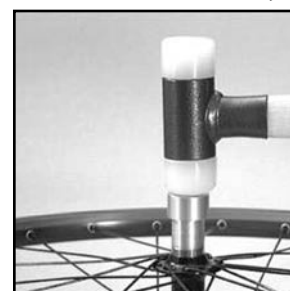


Fig. 7K

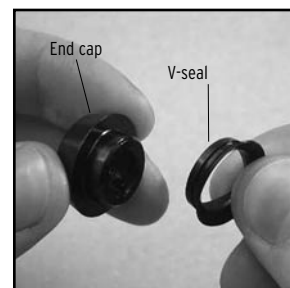
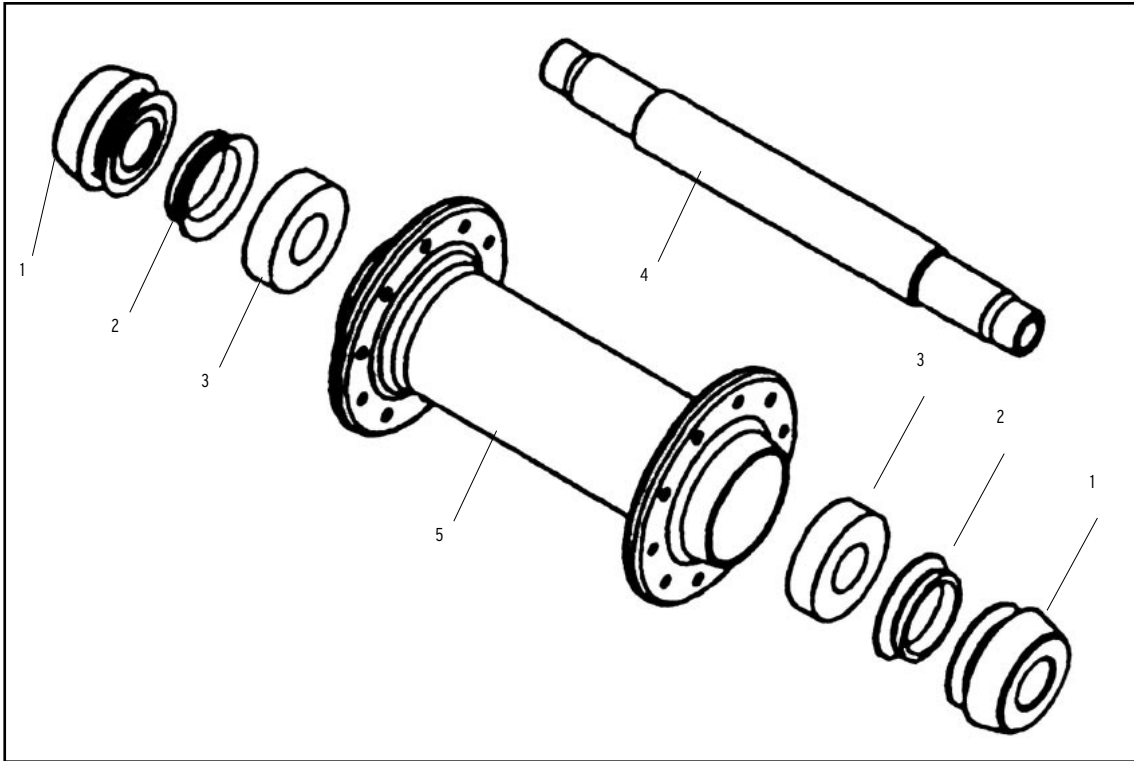


Fig. 8K

Exploded view and Parts list



Pos	Description
1	End cap
2	V-seal
3	Bearing
4	Axle
5	Hub shell

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle kit	99/00/01	All	1(2), 2(2), 3(2), 4	70361
Bearing	99/00/01	All	3	211349

Comp rear hub

Bontrager Race Modified rear wheel, 2003 Race Lite ATB, 2002/2003 Race Lite Road rear wheel



Fig. 1G

Recommended tools

Long bearing press
Short bearing press
17mm cone wrench
Multi-purpose grease
Bench vise
Axle vise
Hammer, soft faced
Thin-bladed slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

1. Place the axle vise in the bench vise and clamp the left-hand end of the axle.
2. Remove the cassette.
3. Loosen the right end nut with the 17mm cone wrench and remove the end nut (Fig. 1G).

4. Pull off the freehub body with your fingers.
The spacer (Fig. 2G) may be stuck to the inside of the freehub body with grease.

5. Remove the spacer (Fig. 2G).
6. With the wheel removed from the vise, tap the right end of the axle with the hammer until loose. Pull the axle from the left side of the hub shell (Fig. 3G).

7. Place the right end of the axle into the axle vise.
8. Loosen the left end nut with the 17mm cone wrench, and remove it from the axle. Also remove the bearing.

9. Remove the retainer spring (Fig. 4G) and pawls from the hub with the screwdriver.

10. Pull the roller bearing retainer from the hub (Fig. 5G).

11. From the left side of the wheel, place the axle through the hub and the bearing. Tap the axle with the hammer to drive the right hub bearing out. Remove the bearing from the axle.

Clean and inspect the parts

Clean all components and inspect them thoroughly. If any cracks or other damage are visible, the parts must be replaced.

2. Place the wheel over the axle with the drive side facing up.

3. Place a new bearing over the axle, black side out. Tap the short bearing press with the hammer to begin pressing the bearing into the hub (Fig. 7G).

4. Leave the short bearing press in place, and lift the wheel from the long bearing press (in the vise). Remove the axle from the hub and replace the wheel over the long bearing press.

5. Again tap the short bearing press with the hammer to press the bearing into the hub.
This is an important step, which ensures the bearing is correctly pressed in.

6. Turn the wheel over and place it drive-side down on the long bearing press. Push the short 33mm end of the axle through the hub and bearing.

7. Slide the second hub bearing over the axle, black side on top.

8. Tap the short bearing press with the hammer to press the second bearing into the hub.

9. Turn the wheel over.
Lightly grease the bearing shell.

10. Slide the roller bearing retainer over the hub bearing and into the housing (Fig. 8G). Be careful not to dislodge any roller bearings.

Installing the pawl spring and pawls

1. Place the pawl spring over the axle and install the spring into the retainer body with the elbow pointing up (Fig. 9G).

2. Push both pawls beneath the spring with a screwdriver (Fig. 10G). Make sure they are placed correctly (Fig. 11G).

3. Lightly grease the roller bearing retainer, pawls, and hub bearing.

Install the freehub body

1. Push the spacer (Fig. 2G) over the axle.

2. Remove the freehub body seal (Fig. 12G). Clean the seal. If it is faulty or damaged, replace it.

3. Clean the freehub body teeth (a toothbrush works well).

4. Lightly grease the seal and freehub

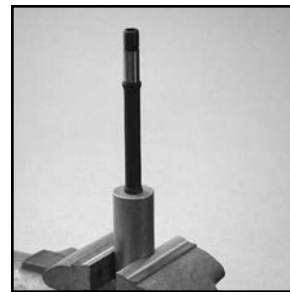


Fig. 6G

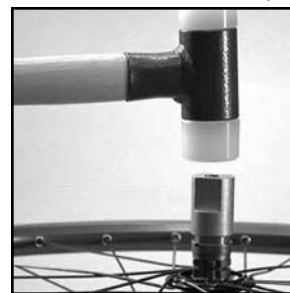


Fig. 7G

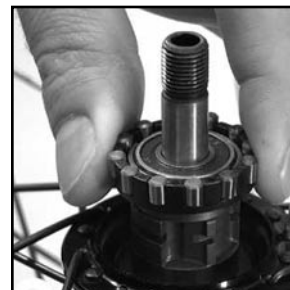


Fig. 8G

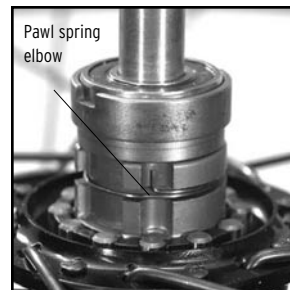


Fig. 9G

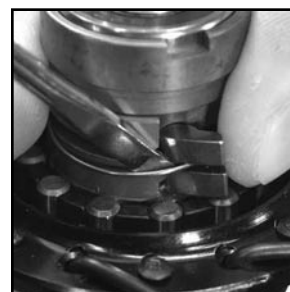


Fig. 10G

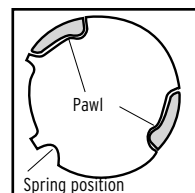


Fig. 11G



Fig. 2G



Fig. 3G

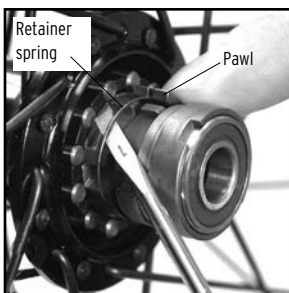


Fig. 4G

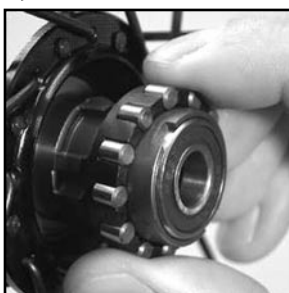


Fig. 5G

ASSEMBLY

1. Clamp the long bearing press into the bench vise. Push the axle, long end first, through the hole in the press. The short, 33mm end of the axle should be on top (Fig. 6G).



Fig. 12G

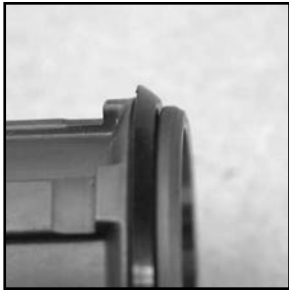


Fig. 13G

teeth.

5. Install the seal into the freehub body with the lip toward the outside of the hub (Fig. 13G).

6. Push the pawls in with a screwdriver as you slide the complete freehub body onto the axle (Fig. 14G). Check the alignment to avoid excessive force which could damage the spring.

7. Grease the freehub end and axle end.

8. Clean and lightly grease the right end nut and end seal (Fig. 15G). Replace the end seal on the end nut with the lip facing the inside.

9. Place the complete end nut onto the axle and tighten it by hand.

10. Place the wheel with the left end of the axle in the axle vise and tighten the right end nut to 150 lb•in (17Nm).

11. Turn the wheel over and clamp the right end nut in the vise.

12. Grease the bearing.

13. Clean and lightly grease the left end nut and end seal.

Replace the end seal on the end nut with the lip facing the inside.

9. Place the complete left end nut onto the axle and tighten it by hand.

10. Tighten the end nut to 150 lb•in (17Nm).

After completely assembling the hub, check for proper functioning by spinning the freehub body. If the pawls do not click into place, the spring may not have been correctly installed, or there could be too much grease in the freewheel.

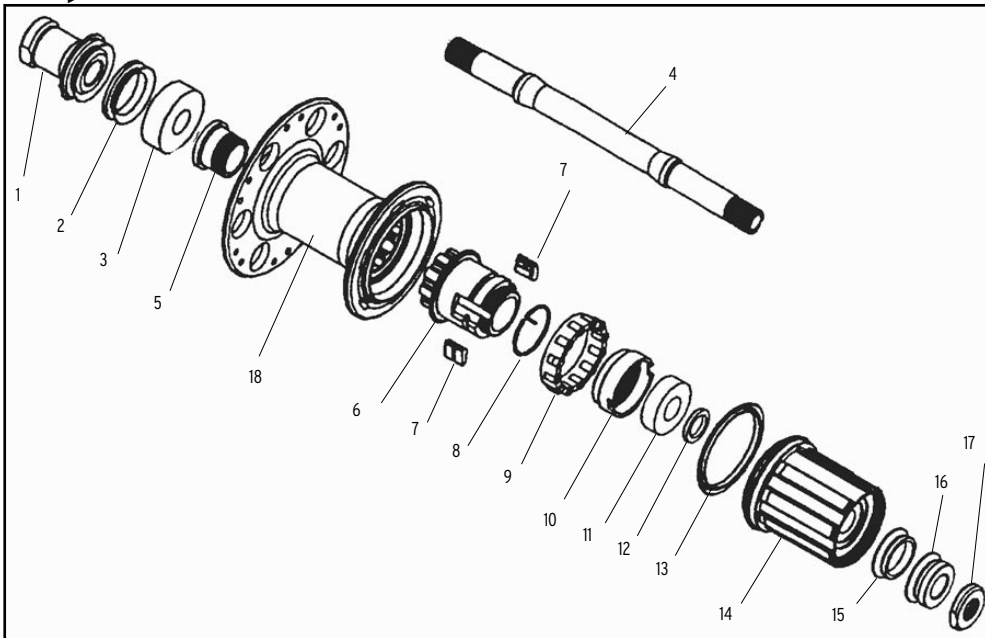


Fig. 14G



Fig. 15G

Exploded view and Parts list



Pos	Description
1	End nut
2	V-seal, left
3	Bearing, left
4	Axle
5	Retaining bolt
6	Driver
7	Pawl
8	Pawl spring
9	Roller retainer
10	Bearing shell
11	Bearing, right
12	Spacer
13	Freehub seal
14	Freehub body
15	V-seal, right
16	End nut, right
17	Nut cap
18	Hub shell

Description	Model year	Model for	Parts included (qty)	TCG Part #
Freehub kit (Shimano)	2000/01	all	7(2), 8, 12, 13, 14	70358
Driver kit	2000/01	all	5, 6, 10	72678
Axle set (130 O.L.D.)	2002/03	Race Lite Road	1, 2, 3, 4, 15, 16, 17	70359
Axle (135 O.L.D.)	2000/01 2003	Race Mod Race Lite ATB	1, 2, 3, 4, 15, 16, 17	70360
Bearing kit	00/01/02/03	all	3, 9, 11	72677
Bearing shell kit	2000/01	all	10, 11	72679
Bearing, left	2000/01	all	3 (6000, 12/26 x 8mm)	211348
Bearing, right	2000/01	all	11 (6900, 10/22 x 6mm)	211349

Important information before you begin with Pro series hubs

Some Bontrager hubs utilize DT Swiss internal parts. This manual is intended for retailers with the appropriate skills and knowledge to work on these hubs. Please read the entire section before carrying out any kind of maintenance work.

This manual details the principle design features of DT Swiss hubs and also provides instructions as to maintenance and repair work. Please take special care to use only original DT Swiss special tools in order to undertake the work details in this manual. Use only DT Swiss replacement parts.

In this manual, the hubs are shown installed in a complete wheel. Maintenance work should be carried out on complete wheels where possible. Otherwise, some steps can not be carried out correctly.

This manual provides technical and spare parts information for these hubs. If you have further questions about these hubs regarding technical information, support, or warranty, they should be directed to Bontrager Technical Support via phone or on the Bontrager web site at www.bontrager.com.

In the event of improper servicing of the hubs, Bontrager has the right to refuse any warranty.

Special information before you begin

Bearing play: A small amount of play between the freehub body and the hub shell is automatically eliminated when the wheel is installed and the quick release is tightened.

Bearing resistance: New or newly re-built hubs have a higher rolling resistance than used hubs because the grease in the freehub has not yet been evenly distributed and the seals have not yet bedded in.

Aluminum freehub bodies: For hubs with an aluminum freehub body, we recommend cassettes using a solid, one piece spider like the Shimano Dura-Ace, Ultegra, XTR, or Deore XT. Cassettes using loose or bolted sprockets like Shimano Deore LX can cause notches in the freehub body. This can cause difficulties when later removing the cassettes from the freehub body (see "Removing Cassettes" on this page).

Check your work: Before use, always check the rear hub for proper functioning. Check the freehub body and the ratchet mechanism. If they do not function correctly, the rear hub should not be used until the fault is corrected. If you are unable to correct the fault, consult Bontrager Technical Support.

Regular Maintenance

Maintenance of the rear and front hubs should be performed at least once a year. This maintenance schedule is based on normal usage. If you ride your bike more than average, or in rain, snow, or off road conditions, service your bicycle more often than the schedule suggests. If any part appears to be malfunctioning, inspect and service it immediately.

Things to avoid

Avoid high pressure washing systems, like those at most car washes. The high pressure can bypass bearing seals,

letting water into the bearings. Do not use any kind of solvents or tensides- this can damage the hub.

Determining the year of hub

There are two styles of rear hub, with some unique parts and different instructions for assembly and disassembly. To determine which hub type you will be working on, it is necessary to remove the freehub. With the star ratchet removed, you will be able to see the right side shell bearing. If the bearing is completely visible due to its 24mm outer diameter (Fig. FH5), it's a year 2000 hub. The 2001 model uses a larger, 28mm diameter bearing (Fig. FH6) that is partially covered by the ring nut (requiring the removal of the ring nut).

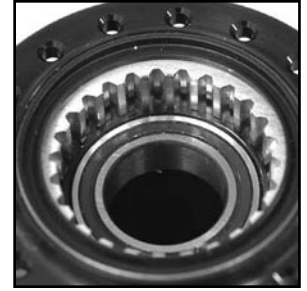


Fig. FH5

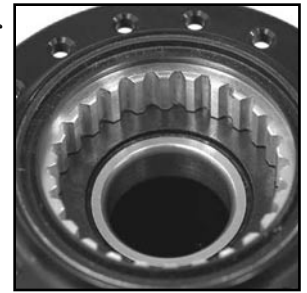


Fig. FH6

Removing the cassette from the freehub body

The cassette does not need to be removed from the freehub body to perform regular maintenance. However, if you decide to remove it, it should only be removed after the hub has been completely re-assembled.

1. Release the lockring using a lockring tool.
2. Loosen the cassette by lightly tapping it counter-clockwise with the hammer.
3. Remove all the sprockets from the freehub body.
4. Use a fine file to remove bad notches from the aluminum freehub body (Fig. 14H). The aluminum freehub body must be cleaned and inspected. If any cracks or other damage is visible, the components must be replaced.

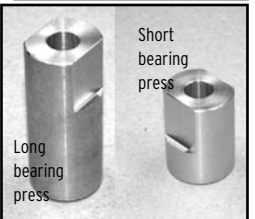
Note: Notches on the freehub body do not have a negative influence on the functionality of the freewheel.



Fig. FH7



Freehub seal installation tool



Long bearing press

Short bearing press

Required tools

Maintenance of Pro level hubs requires special tools, available as TCG part #211415:

- Freehub seal installation tool
- Long bearing press
- Short bearing press
- Special screwdriver
- DT Swiss special freehub grease
- DT Swiss multi-purpose grease
- Spline tool



Special screwdriver



Spline tool

Pro front hub

2002 Bontrager Race Lite ATB, Race Lite 29, Race X Lite and Race X Lite Carbon front wheels, 2003 Race X Lite Aero

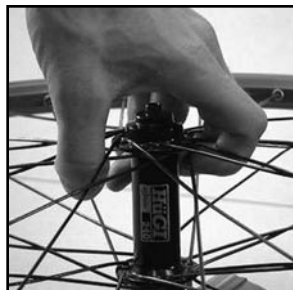


Fig. 1J



Fig. 2J

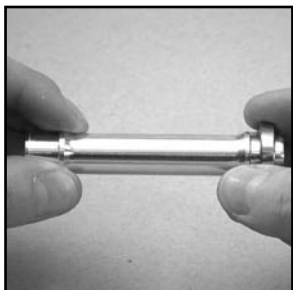


Fig. 3J



Fig. 4J

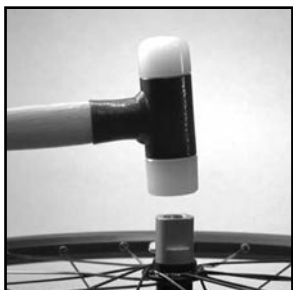


Fig. 5J

Recommended tools

Long bearing press
Short bearing press
Multi-purpose grease
Bench vise
Axle vise
Hammer, soft faced

DISASSEMBLY

1. Loosen both end caps by rotating them in opposite directions with your fingers.

2. Clamp the axle end cap (either side) in the axle vise (avoid over tightening).

3. Pull the wheel upward (Fig. 1J) to remove the end cap held by the vise.

4. Tap the axle out of the hub with the hammer (Fig. 2J).

5. Slide the bearing off the axle (Fig. 3J).

6. Re-insert the axle into the hub from the side opposite the remaining bearing. With the axle end resting on the inside of the bearing, tap the bearing out of the shell with the hammer.

Clean and inspect all components. If any cracks or other damage are visible, replace the part.

ASSEMBLY

1. Clamp the long bearing press into the vise.

2. Push the new bearing over the front axle. Insert the axle into the bearing press (Fig. 4J).

2. Place the wheel over the axle and pull the axle out by about 10 mm (1/2 inch). Push the second bearing over the axle and into the hub.

3. Center the axle using the short bearing press.

4. Tap both bearings into place with the hammer (Fig. 5J) at the same time.

Turn the axle to check the bearings. You should not be able to feel any irregular friction. Make sure that there is no play in the axle.

5. Grease both the outer surface of both bearings.

6. Pull the V-seal off the both end caps (Fig. 13I). Clean each seal thoroughly with a cloth, lightly grease it, and reinstall it on the end cap with the open 'V' facing the hub.

7. Push the completed adapters into place with your fingers.

After completing assembly of the hub, check its function by spinning the axle with your fingers. It should rotate freely without irregular friction. A small amount of lateral play is acceptable if the play is eliminated when the wheel is installed with the quick release properly closed.

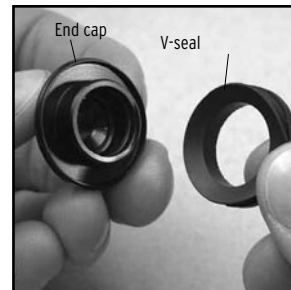


Fig. 6J

2002 Race Lite, ATB, Race Lite 29, 2003 Race X Lite ATB

O.L.D.	100 mm
Spoke hole quantity	24°
Spoke hole P.C.D.	40.5 mm
Q.R. rod outer diameter	5 mm

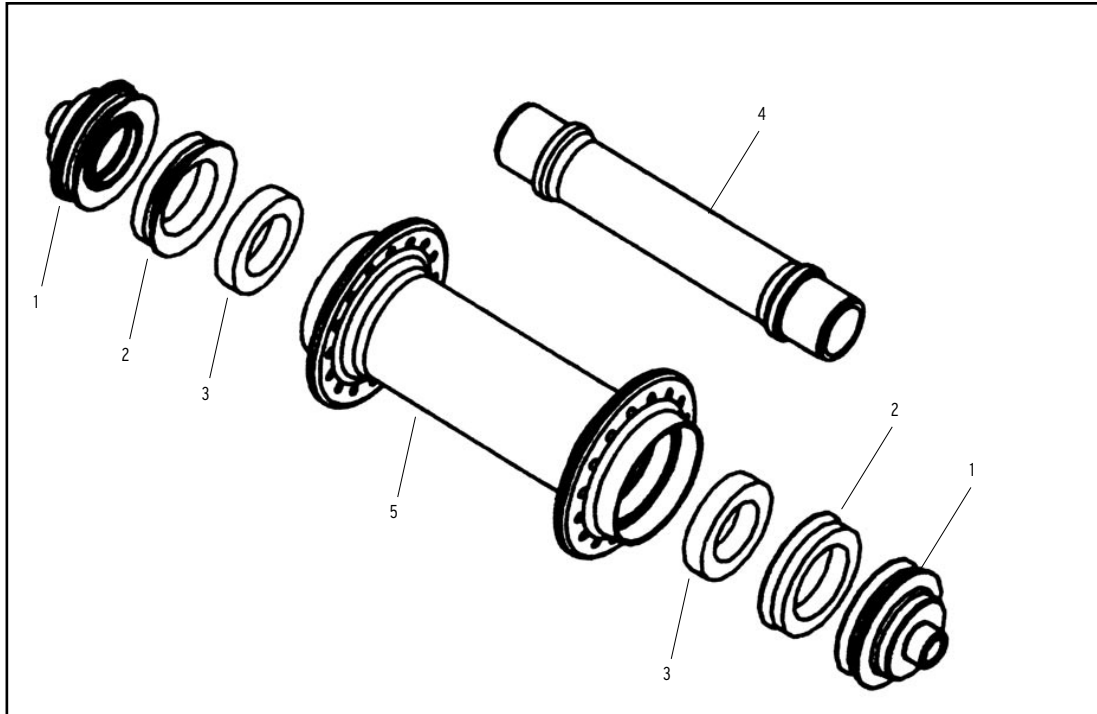
2002/2003 Race X Lite

O.L.D.	100 mm
Spoke hole quantity	20°
Spoke hole P.C.D.	38.0 mm
Q.R. rod outer diameter	5 mm

2002/2003 Race X Lite Carbon, Race X Lite Aero

O.L.D.	100 mm
Spoke hole quantity	16°
Spoke hole P.C.D.	38.0 mm
Q.R. rod outer diameter	5 mm

Exploded view and Parts list



Pos	Description
1	End nut
2	V-seal
3	Bearing
4	Axle
5	Hub shell

Description	Model year	Model for	Parts included (qty)	TCG Part #
Axle kit	00/01/02/03	all	1(2), 2(2), 3(2), 4	70357
V-seal	00/01/02/03	all	2	211342
Bearing	00/01/02/03	all	3(6802, 15/24 x 5mm)	211344
End cap kit	00/01/02/03	all	1(2)	221803

Pro rear hub

Bontrager Race Lite ATB, Race Lite 29, Race X Lite, Race X Lite Carbon rear wheels, Race Lite Aero

A running change to hubs was made in 2001; the newer hub has a part number embossed in the shell. See exploded diagrams for differences



Fig. 1I

Recommended tools

Long bearing press
Short bearing press
17mm cone wrench
Multi-purpose grease
Bench vise
Axle vise
Hammer, soft faced
Thin-bladed slot screwdriver

DISASSEMBLY

Hub parts and names are referenced on next page.

Disassemble the freehub

1. Place the axle vise in the bench vise and clamp the left-hand end of the axle.

2. Pull sharply with your fingers to remove the cassette, with the freehub body attached (Fig. 1I).

3. Remove the star ratchet, spacer and spring (under the star ratchet) from the hub (Fig. 2I).

4. Remove the second star ratchet and second spring from the freehub body.

Disassemble the ring nut

1. Clamp the spline tool into a bench vise (Fig. 3I).

2. Push the right side axle end into the cylinder. With the splines engaged, turn the wheel firmly in an anti-clockwise direction. The ring nut will be loosened, and the seal between the hub and freehub body will fall over the spline tool onto the vise.

3. Thoroughly clean and inspect all components, including inside the hub, with a dry cloth. If necessary, use a toothbrush. If cracks or any other damage is visible, the parts must be replaced.

Disassemble the bearings

1. From the right side, tap the axle out of the hub with the hammer (Fig. 4I). Remove the axle from the hub.

2. Slide the left end cap, seal and bearing off the axle.

3. Turn the axle around and insert it into the left side of the hub until the axle collar butts against the bearing. Tap the second bearing out with the hammer.

4. Thoroughly clean and inspect all components with a dry cloth. If cracks or any other damage is visible, the parts must be replaced.

ASSEMBLY

Install the right hand bearing

1. Clamp the spline tool into a vise.

2. Place the spacer over the splines (Fig. 5I).

3. Place the bearing onto the long end of the axle and push the bearing onto the spline tool (Fig. 6I).

4. Place the wheel over the axle, drive side down. Push the short bearing press over the other end of the axle. Tap the bearing into place with the hammer (Fig. 7I).

Install the ring nut

1. Clamp the spline tool into the vise with only the splines above the jaws (Fig. 8I).

2. Inspect the ring nut for cracks or damage. If damaged, replace it.

3. Place the ring nut with the recess uppermost over the splines (Fig. 9I). Place the spacer ring flat inside the ring nut.

4. Place the wheel, drive side down, over the spline tool. Insert the right axle end through the spline tool. Carefully screw the ring nut into the hub by turning the wheel clockwise.

Install the freehub body seal

Important: When installing a new seal, only the right-hand bearing should be in place. The left-hand bearing must not be pressed in until after the seal has been installed.

1. Inspect the seal. If the seal shows signs of wear or damage, replace it.

2. Clamp the short bearing press into a vise (Fig. 10I) and place the wheel, drive side up, over the tool.

3. Place the seal over the freehub body seal installation tool (Fig. 11I) with the 'V' facing the hub.

4. With the seal on the tool, push them together over the axle.

5. Place the long bearing press over the axle.

6. Press the seal into the hub by tapping it with the hammer.

Install the left hand bearing

1. Clamp the spline tool into the bench vise (Fig. 3I).

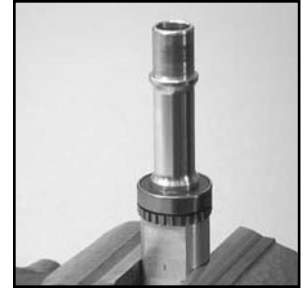


Fig. 6I



Fig. 7I

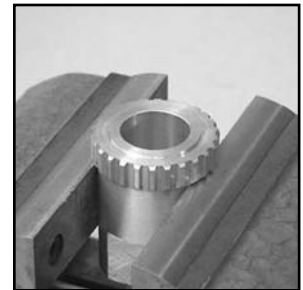


Fig. 8I

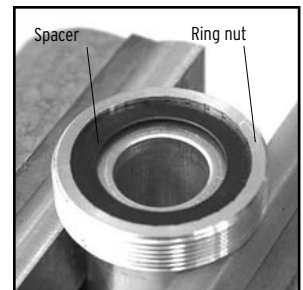


Fig. 9I



Fig. 10I

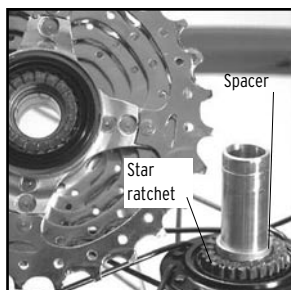


Fig. 2I

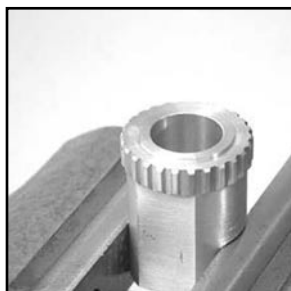


Fig. 3I

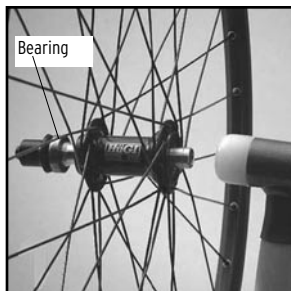


Fig. 4I

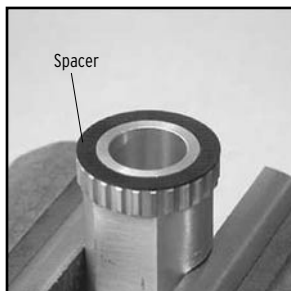


Fig. 5I



Fig. 11I



Fig. 12I

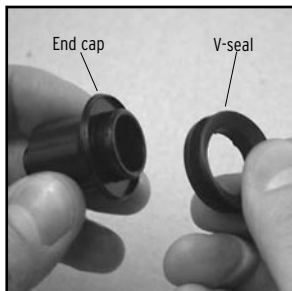


Fig. 13I

Before positioning the spacer and the ratchet in the freehub body, check that the freehub body bearings spin freely without binding. If any binding or scratching is detected, replace the freehub body with a new or reconditioned one.

2. Push the wheel over the tool, drive side down.
3. Place the bearing carefully into the hub (Fig. 12I).
4. Place the short bearing press over the axle (Fig. 7I). Tap the bearing into place with the hammer.

Turn the axle and check that you do not feel any irregular friction.

5. Lightly grease the surface of the bearing.
6. Pull the V-seal off the end cap (Fig. 13I). Clean it thoroughly with a cloth, lightly grease it, and reinstall it on the end cap with the open 'V' facing the hub.
7. Replace the completed end cap onto the left axle end.

Install the freehub

1. Grease the splines inside the hub shell with DT Swiss special grease (only).
2. Push the spacer over the axle (Fig. 14I) until it butts against the bearing.
3. Insert the spring, with the large diameter in contact with the bearing (Fig. 14I).
4. Clean the outside end of the freehub body with a clean cloth.

5. Carefully clean the star ratchets with a dry cloth. Inspect both star ratchets for damage. If any damage is visible, replace the ratchet.

5. Lightly grease both star ratchets with DT Swiss special grease (only).

6. Place the spacer ring into the freehub body. Place the spring into the freehub body with the large diameter end in contact with the spacer ring (Fig. 15I).

7. Place both greased star ratchets into the freehub body (Fig. 16I).

8. Push the freehub body, together with the cassette, over the axle.

Caution: Ensure the freehub body is not tilted !

9. Pull the V-seal off the right end cap (Fig. 13I). Clean it thoroughly with a cloth, lightly grease it, and reinstall it on the end cap with the open 'V' facing the hub.

10. Place the end cap over the right end of the axle and manually press into place.

After completing assembly of the hub, check its function by giving the cassette a sharp, quick spin. If the ratchets do not catch, there could be too much grease inside the freehub body, or the wrong type of grease was used. In this case, remove some of the grease or replace it using the correct grease.

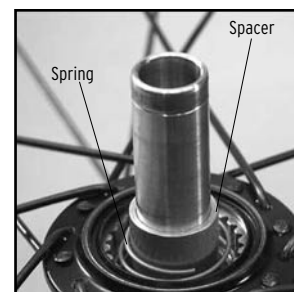


Fig. 14I

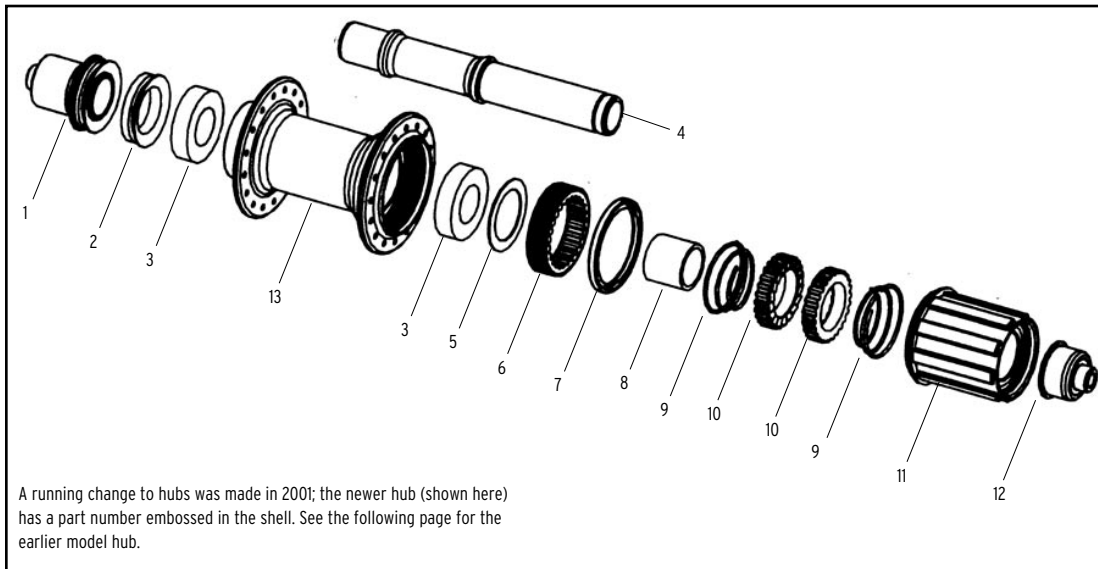


Fig. 15I



Fig. 16I

Exploded view and Parts list- 2001-2003



Pos	Description
1	End cap, left
2	V-seal
3	Bearing
4	Axle
5	Spacer
6	Ring nut
7	Washer
8	Spacer
9	Spring
10	Star ratchet
11	Freehub body
12	End cap, right
13	Hub shell

Description	Model year	Model for	Parts included (qty)	TCG Part #
Freehub kit (Shimano)	02/03	all	8, 9(2), 10(2), 11	70354
Freehub kit (Campagnolo)	02/03	all	8, 9(2), 10(2), 11	211579
Star ratchet and spring kit	02/03	all	9(2), 10(2)	211343
Axle kit 130mm O.L.D. (Shimano)	02/03	all road	1, 2, 3(2), 4, 13	70355
Axle kit 130mm O.L.D. (Campagnolo)	02/03	all road	1, 2, 3(2), 4, 13	211580
Axle kit 135mm O.L.D.	02/03	Race Lite ATB	1, 2, 3(2), 4, 13	70356
V-seal	02/03	all	2	211342
Freehub seal	02/03	all	7	211591
Bearing	02/03	all	3 (6902, 15/28 x 7mm)	211345

2001, 2002 Race Lite, 2003 Race X Lite ATB

O.L.D. 135 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D., right 53.0 mm
 Spoke hole P.C.D., left 44.0 mm
 Q.R. rod outer diameter 5 mm

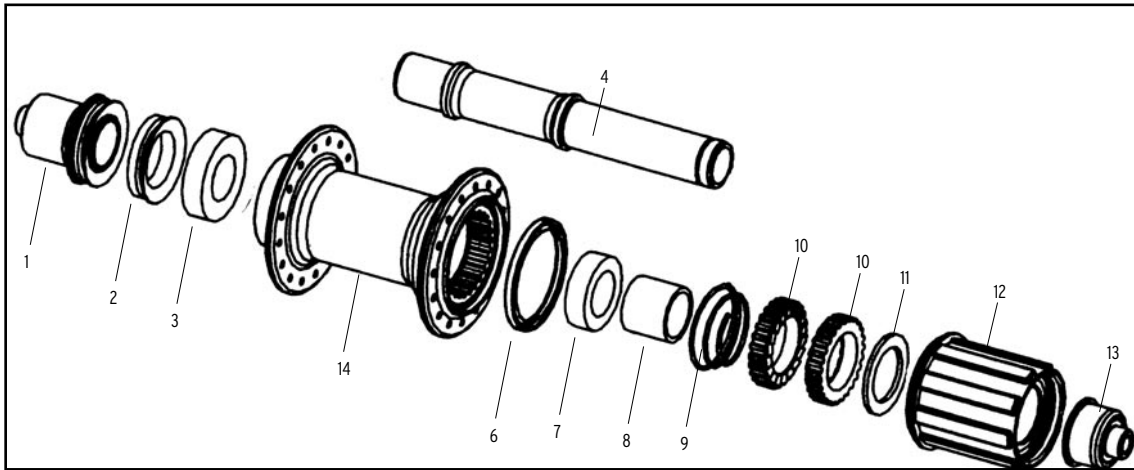
2002/2003 Race X Lite

O.L.D. 130 mm
 Spoke hole quantity 24°
 Spoke hole P.C.D., right 53.0 mm
 Spoke hole P.C.D., left 44.0 mm
 Q.R. rod outer diameter 5 mm

2002/2003 Race X Lite Carbon, Race X Lite Aero

O.L.D. 130 mm
 Spoke hole quantity 16°
 Spoke hole P.C.D., right 53.0 mm
 Spoke hole P.C.D., left 44.0 mm
 Q.R. rod outer diameter 5 mm

Exploded view and Parts list- 2000-2001



Pos	Description
1	End cap
2	V-seal
3	Bearing
4	Axle
6	Freehub seal
7	Bearing
8	Spacer
9	Spring
10	Star ratchet
11	Washer
12	Freehub body
13	End nut, right
14	Hub shell

Description	Model year	Model for	Parts included (qty)	TCG Part #
Freehub kit (Shimano)	2000	Race, Race Lite	8, 9(2), 10(2), 12	70354
Star ratchet and spring kit	2000	Race, Race Lite	9(2), 10(2)	211343
Axle	2000	Race, Race Lite	1, 2, 3(2), 13 (135mm O.L.D.)	70356
Freehub seal	2000	Race, Race Lite	6	211591
Bearing, left	2000	Race, Race Lite	3 (6902, 15/28 x 7mm)	211345
Bearing, right	2000	Race, Race Lite	7 (3802, 15/24 x 7mm)	211346

2000 Race Lite

O.L.D. 135 mm
 Spoke hole quantity 28°
 Spoke hole P.C.D., right 53.0 mm
 Spoke hole P.C.D., left 44.0 mm
 Q.R. rod outer diameter 5 mm