2009

SRAM

(english) technical manual

part # GEN.0000000000302

SRAM CORPORATION WARRANTY

EXTENT OF LIMITED WARRANTY
SRAM warrants its products to be free from defects in materials or workmanship for a period of two years after original purchase. This warranty only applies to the original owner and is not transferable.

Claims under this warranty must be made through the retailer where the bicycle or the SRAM component was purchased. Original proof of purchase is required.

LOCAL LAW
This warranty statement gives the customer specific legal rights. The customer may also have other rights which vary from state to state (USA), from province to province (Canada), and from country to country elsewhere in the world.

To the extent that this warranty statement is inconsistent with the local law, this warranty shall be deemed modified to be consistent with such law, under such local law, certain disclaimers and limitations of this warranty statement may apply to the customer. For example, some states in the United States of America, as well as some governments outside of the United States (including provinces in Canada) may:

a. Preclude the disclaimers and limitations of this warranty statement from limiting the statutory rights of the consumer (e.g. United Kingdom).

b. Otherwise restrict the ability of a manufacturer to enforce such disclaimers or limitations.

LIMITATIONS OF LIABILITY
To the extent allowed by local law, except for the obligations specifically set forth in this warranty statement, In no event shall SRAM or its third-party suppliers be liable for direct, indirect, special, incidental, or consequential damages.

LIMITATIONS OF WARRANTY
• This warranty does not apply to products that have been incorrectly installed and/or adjusted according to the respective SRAM technical installation manual. The SRAM user manuals can be found online at www.sram.com, www.rockshox.com or www.avidbike.com.

• This warranty does not apply when the product has been modified.

• This warranty does not apply when the serial number or production code has been deliberately altered, defaced or removed.

• This warranty does not apply to damage to the product caused by a crash, impact, abuse of the product, non-compliance with manufacturer's specifications of usage or any other circumstances in which the product has been subjected to forces or loads beyond its design.

• This warranty does not apply to normal wear and tear. Wear and tear parts are subject to damage as a result of normal use, failure to service according to SRAM recommendations and/or riding or installation in conditions or applications other than recommended.

WEAR AND TEAR PARTS ARE IDENTIFIED AS:
Dust seals/Bushings/Air sealing o-rings/Glide rings/Rubber moving parts/Foam rings/Rear shock mounting hardware and main seals/Stripped threads and bolts (aluminum,titanium, magnesium or steel)/Upper tubes (stanchions)/Brake sleeves/Brake pads/Chains/Sprockets/Cassettes/Shifter and brake cables (inner and outer)/Handlebar grips/Shifter grips/Jockey wheels/Disc brake rotors/Tools

• This warranty shall not cover damages caused by the use of parts of different manufacturers.

• This warranty shall not cover damages caused by the use of parts that are not compatible, suitable and/or authorized by SRAM for use with SRAM components.

• This warranty shall not cover damages resulting from commercial (rental) use.

For exploded diagram and part number information, please refer to the Spare Parts Catalog available on our website at www.sram.com.
For order information, please contact your local SRAM distributor or dealer.
Information contained in this publication is subject to change at any time without prior notice. For the latest technical information, please visit our website at www.sram.com.
Your product's appearance may differ from the pictures/diagrams contained in this catalog.

2009

SRAM®

Technical Manual

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RED / FORCE / RIVAL · REAR DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	Red	Force	Rival
Speeds	10	10	10
Shifter Compatibility	SRAM Double Tap shifters (Red / Force / Rival) / SRAM TT Shifters		
Cogsets	SRAM 10 speed and other 10 speed Shimano® cogsets (largest Cog maximum 28 teeth)		
Chains	SRAM 10 speed Power Chains and Shimano® 10 speed chains		
Cranks / Chainrings	10 speed compatible, 53-39 / 50-34 / 50-36 / 48-34 / 52-36		
Cable & Housing	High quality 1.1 mm shifting cable and 4 or 5 mm compressionless housing, high quality, with non-sealed end caps of maximum diameter 5.8 mm and maximum length 16 mm		
Total	33 T	33 T	33 T
Max Sprocket	28 T	28 T	28 T
Min Sprocket	11 T	11 T	11 T
Front Difference	16 T	16 T	16 T
Parallelogram Spring	Titanium	Steel	Steel
Pulleys	Ceramic cartridge bearing	Cartridge bearing	Cartridge bearing
Direct Mount	Yes	Yes	Yes
B-Knuckle	Forged Aluminum	Aluminum	Aluminum
Outer Link	Forged Aluminum	Aluminum	Aluminum
Inner Link	Carbon	Magnesium	Aluminum
Outer Cage	Carbon	Carbon	Aluminum
Inner Cage	Carbon	Aluminum	Aluminum
Hanger Bolt	Aluminum	Aluminum	Aluminum

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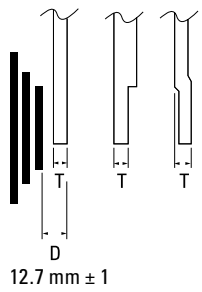

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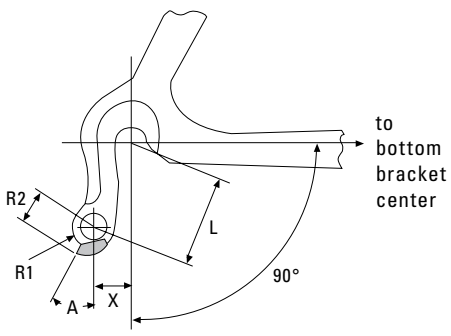
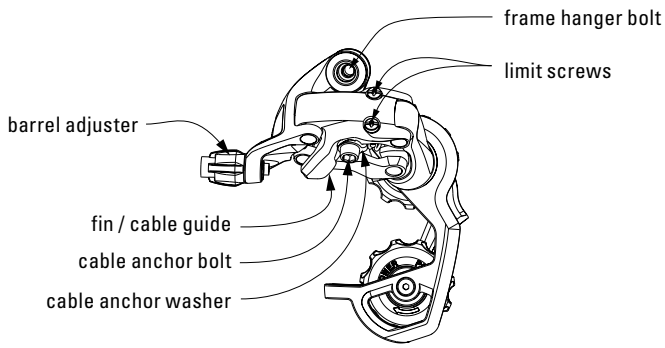


DERAILLEUR ANATOMY



FRAME DIMENSIONS

(**Figure 1** and **Figure 2**)

For optimal rear derailleur performance, the recommended rear derailleur hanger length (L) should be 26 – 28 mm.

L	X	A	R1	R2	T
26	6 - 10	30° – 35	8.5 max	11.5 - 12.5	7 - 8
28	8 - 10	30° – 35	8.5 max	11.5 - 12.55	7 - 8

Chainstay length ≥ 405 mm

RED / FORCE / RIVAL · REAR DERAILLEURS ASSEMBLY

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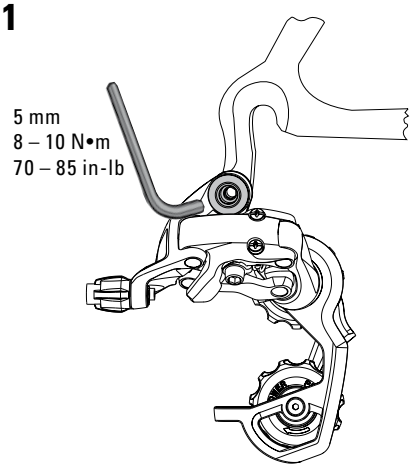

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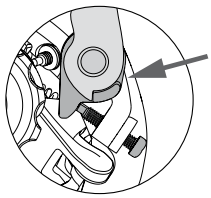

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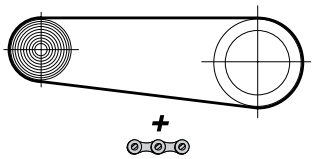

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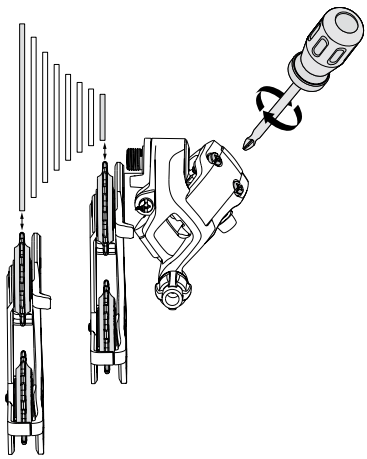

ASSEMBLY

ADVICE

Check the rear derailleur hanger alignment. A bent rear derailleur hanger will result in inaccurate index shifting.

• Attach the rear derailleur to the frame's rear derailleur hanger using a 5 mm hex wrench (**Figure 1**).

• Check that the b-adjust washer tab is clear of the rear derailleur dropout tab (**Figure 2**).

• Tighten the 5 mm hex hanger bolt to 8 – 10 N•m (70–85 in-lb) (**Figure 1**).

CHAIN LENGTH

• Bypassing the rear derailleur, run the chain around the largest cog/large chainring combination (**Figure 3**).

• Add 2 link or 1 link + connection link to this length for proper chain length.

LIMIT SCREWS ADJUSTMENT

• View the rear derailleur and pulleys from behind the rear of the bicycle (**Figure 4**).

• Turn the limit screw marked 'H' on the outer link of the derailleur to align the upper guide pulley center with the outboard edge of the smallest cog (**Figure 4**).

• While turning the crank, push the rear derailleur towards the larger cogs by hand.

• Align the upper guide pulley under the largest cog, center to center, by turning the limit screw marked 'L' on the outer link (**Figure 4**).

CHAIN GAP ADJUSTMENT

Chain gap is the distance between the upper guide pulley and the cog the chain is riding on. Optimal chain gap is small enough to allow quick, efficient shifts to and from any cog, but large enough to allow smooth shifts to and from the largest cog.

• Shift the chain to the small chain ring.

• Check the chain gap between the tip of the smallest cog and the tip of the upper guide pulley. While turning the crank, push the rear derailleur by hand to the largest cog and check the chain gap in this position. (**Figure 5**).

• Using a screw driver, turn the b-adjust screw until the minimum chain gap in either position equals approximately 6 mm.

ADVICE

Setting the chain gap at this point of your installation may be considered a rough estimate. Precision index shifting may require small changes of the b-adjustment while setting the proper cable tension.

Do not use the b-adjust screw to adjust the rear derailleur to act as a chain-tensioning device or to prevent chain suck. This increases the chain gap causing poor shifting performance.

INDEX SHIFTING ADJUSTMENT

• Attach the rear derailleur to the frame's rear derailleur hanger using a 5 mm hex wrench (**Figure 1**).

• Check that the chain and the rear derailleur are in the smallest cog position.

• Cut the rear piece of cable housing. Make sure that it is not too short or long (**Figure 6**).

• Make sure the shifter cable is fully released (hardest (highest) gear at rear shifter).

• Turn the rear derailleur barrel adjuster clockwise fully into the derailleur, then back it off 1 full turn.

• Feed the rear shifter cable through the rear derailleur cable housing, stops and cable guides.

• Thread the cable through the rear derailleur barrel adjuster and around the cable guide on the fin (**Figure 6**).

• Pull the cable tight and position it under the cable anchor washer.

• Tighten the 5 mm hex cable anchor bolt to 4 – 5 N•m (35 – 45 in-lb).

• Rapidly shift the chain and derailleur up and down the cassette several times. If the cable slips repeat the two former steps.

• Shift the chain to the smallest cog.

• While pedaling, move the shifter up one detent.
– If the chain hesitates or does not shift to the second cog, increase the cable tension by turning the derailleur barrel adjuster counterclockwise.
– If the chain shifts beyond the second cog, decrease the cable tension by turning the derailleur barrel adjuster clockwise.

• Repeat the two former steps until shifting and cable tension is accurate.

• While turning the crank, shift the chain up and down the cassette and chain rings several times to ensure that your derailleur is indexing smoothly.

RED / FORCE / RIVAL · REAR DERAILLEURS
ASSEMBLY

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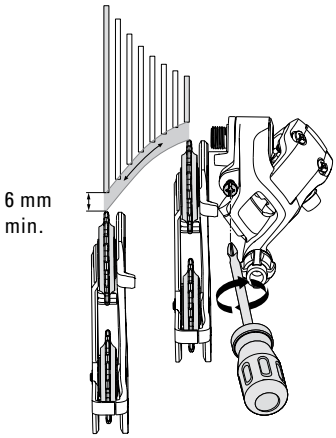

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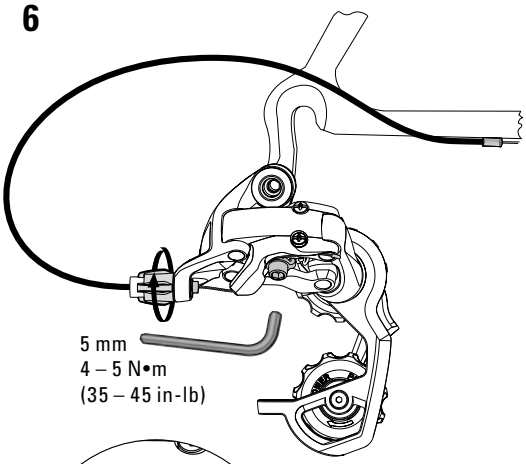

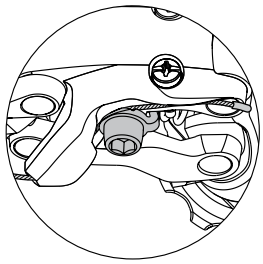

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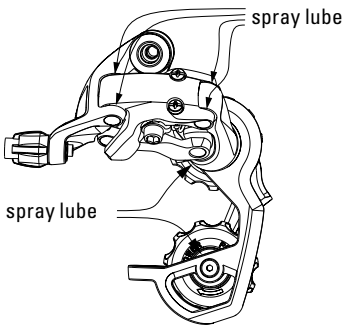

MAINTENANCE

Wipe out debris from the interior of cage plates and parallelogram linkage. Brush the derailleur with clean or soapy water. Rinse the derailleur with clean water and let air dry. Do NOT use a pressure washer.

ATTENTION

Red: The ceramic pulley bearings require regular maintenance. Re-grease bearings using SKF LGHP2 grease after 100 hrs of use in dry conditions or immediately following any significant exposure to water (riding in heavy rain, water crossings). Use a sharp pick to carefully remove the black rubber seal from one side of the bearing (**Figure 2**), clean the bearing thoroughly and repack with a quality waterproof grease, then replace the rubber seal by pressing it into place.

TROUBLESHOOTING

Problem	Cause	Remedy
Chain jumps from smallest sprocket to frame dropout.	High gear limit screw is not adjusted properly.	Turn in screw H until the guide pulley is aligned with the smallest sprocket.
Difficult or impossible to shift chain onto smallest sprocket.	High gear limit screw is not adjusted properly	Unscrew screw H until the guide pulley is aligned with the smallest sprocket.
Chain jumps over largest sprocket and falls between the spokes and largest sprocket or inner cage plate scrapes on spokes.	Low gear limit screw is not adjusted properly.	Turn in screw L until the guide pulley is aligned with the largest sprocket.
	Rear derailleur or derailleur hanger is bent.	Straighten or replace.
Delayed shifting.	Clearance between guide pulley / sprocket is too large.	Adjust b-adjust screw by rotating counterclockwise.
Rough shifting behavior.	Clearance between guide pulley / sprocket is too small.	Adjust b-adjust screw by rotating clockwise.
Shifts more gears onto smaller sprockets than intended	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto larger sprocket	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter clockwise.
Delayed shifting onto smaller sprocket	Shift cable is too tight.	Lubricate or replace cable and housing.
	Excessive cable friction, pinched or poorly routed cable.	Check for excessive bending of cable housing.

RED / FORCE / RIVAL · FRONT DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	Red	Force	Rival
Braze-on	Yes	Yes	Yes
31.8 mm	Yes	Yes	Yes
34.9 mm	Yes	Yes	Yes
Rear Compatibility	10 speed	10 speed	10 speed
Shifter Compatibility	SRAM Double Tap Shifters / SRAM TT Shifters		
Cogests	SRAM 10 speed and 10 speed Shimano® cogsets (largest cog - 28 teeth)		
Chains	SRAM 10 speed Power Chains and Shimano® 10 speed chains		
Cranks / Chainrings	10 speed compatible, 53-39 / 50-34 / 50-36 / 48-34 / 52-36		
Cable and Housing	High quality 1.1 mm shifting cable and 4 or 5 mm compressionless housing, high quality, with non-sealed end caps of maximum diameter 5.8 mm and maximum length 16 mm		
Max. Tooth Difference	16 T	16 T	16 T
Cable Routing	Bottom Pull	Bottom Pull	Bottom Pull
Chainstay Angle	61 – 66°	61 – 66°	61 – 66°
Mount Type	Down Swing	Down Swing	Down Swing
Chainline	44.5 mm	44.5 mm	44.5 mm
Band Material	Forged Aluminum	Forged Aluminum	Forged Aluminum
Outer Link	Forged Aluminum	Aluminum	Aluminum
Inner Link	Aluminum	Aluminum	Aluminum
Chain Cage	Hardened Titanium	Steel Chrome Plated	Steel Chrome Plated

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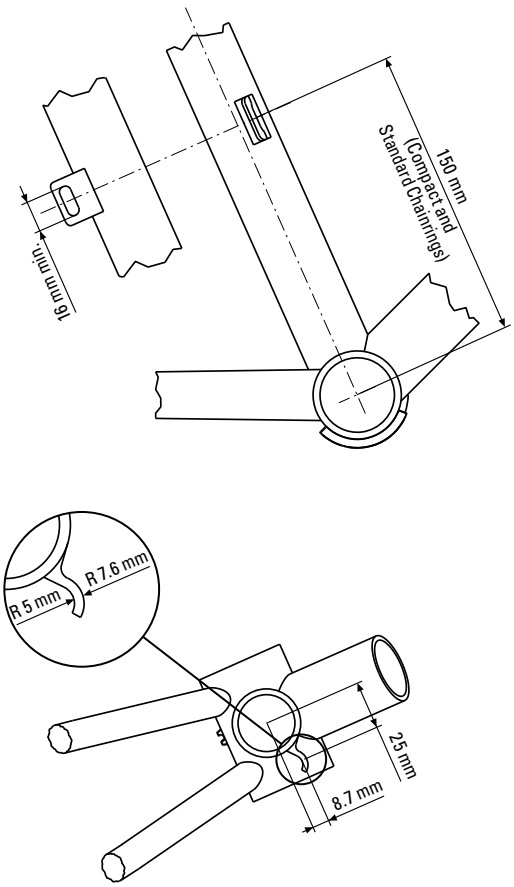

BRAZE-ON FRAME DEFINITIONS
(see **Figure** 1)
The contact surface of the braze-on boss should be aligned parallel with the centerline of the seat tube.

RED / FORCE / RIVAL · FRONT DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

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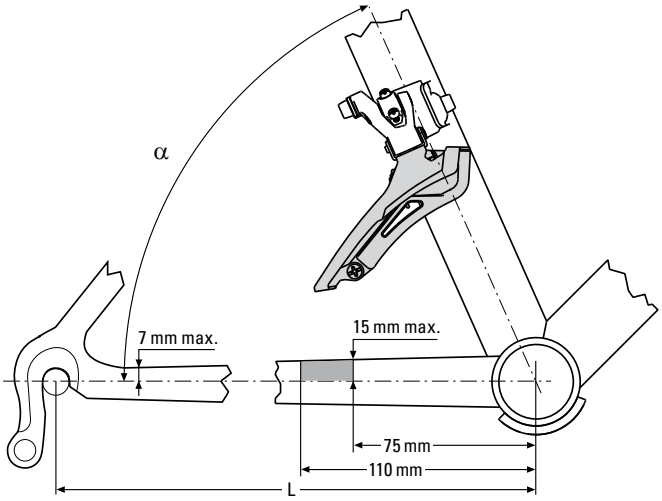

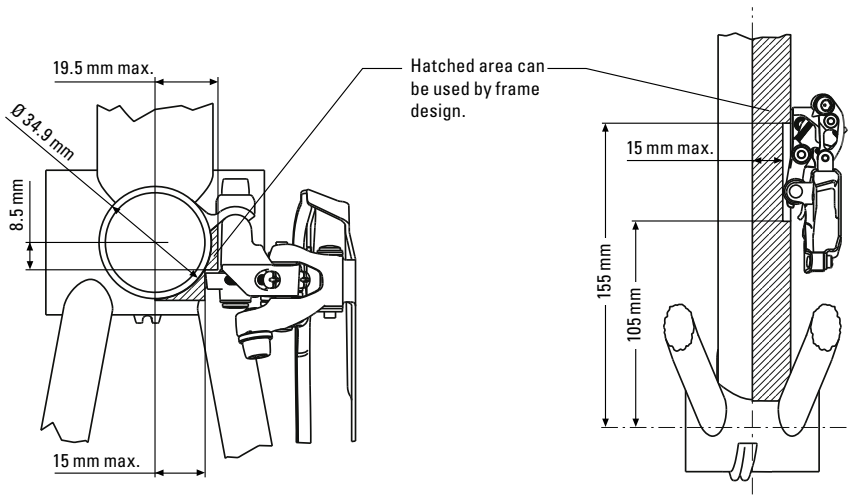

Frame Dimensions
(see **Figure** 2)
The seat tube should be positioned in the center of the bottom bracket shell.

Length of chainstay:
- Road L > 405 mm.
- Rear frame alignment must be symmetrical.

Chainstay angle:
α = 61° – 66°.

Chainline:
44.5 mm.
(Measurement from the center of the bracket to the center of the two chainrings.)

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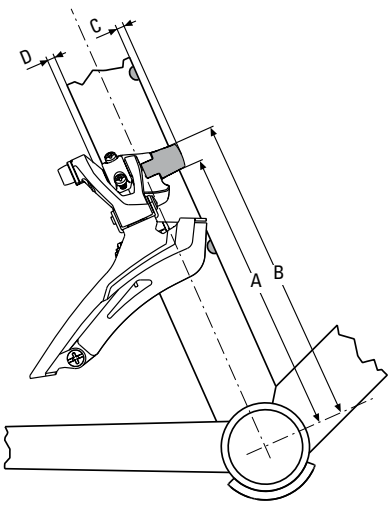

NECESSARY CLEARANCE FOR CLAMP VERSION
(see **Figure** 3)
Be sure to leave enough clearance between bottle cage holes and clamp location.

NECESSARY CLEARANCE
see **Figure 2**

Large Chainring		48 T	50 T	52 T	53 T
Clamp band position	A	135 mm	139 mm	143 mm	145 mm
	B	152 mm	156 mm	160 mm	162 mm

Clamp Version		Red	Force / Rival
Necessary clearance	C	9 mm	4 mm
	D	1 mm	4 mm

RED / FORCE / RIVAL · FRONT DERAILLEURS
ASSEMBLY

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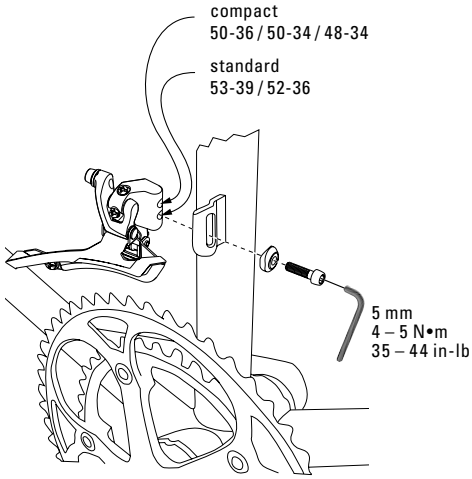

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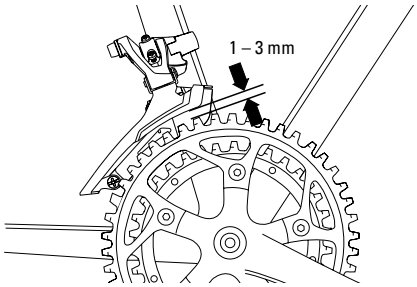

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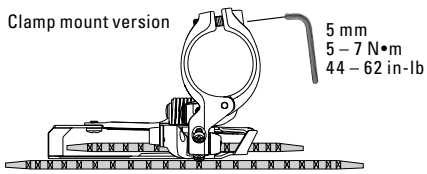

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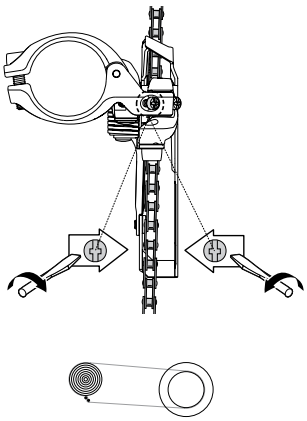


ASSEMBLY

• Red / Force / Rival braze-on mount version (see **Figure 1**): Use upper thread for compact chainrings (50-36 / 50-34 / 48-34) or lower thread for standard chainrings (53-39 / 52-36).

• Red / Force / Rival clamp mount version (see **Figure 2**): Lightly clamp the front derailleur to the seat tube.

• Adjust the position along the seat tube so that clearance between the front derailleur cage and the large chainring is 1 – 3 mm (**Figure 2**).

• At the same time, align the front derailleur cage outerplate to be parallel with the chainrings (**Figure 3**).

• Red braze-on mount version: Tighten 5 mm hex clamp bolt to 5 – 7 N•m (44 – 62 in-lb).

• Force / Rival braze-on mount version: Tighten 5 mm hex clamp bolt to 4 – 5 N•m (35 – 44 in-lb).

• Force / Rival clamp mount version: Tighten 5 mm hex clamp bolt to 3 – 4 N•m (27 – 35 in-lb).

LOW LIMIT ADJUSTMENT

(see **Figure 4**)

• Place the chain on the largest rear cog and the small front chainring.

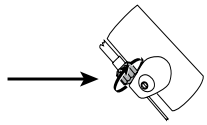
• Adjust the low limit screw (**Figure 4**) so that the chain is positioned close to the inner cage plate without actually touching it (clearance between the front derailleur cage inner plate and the chain is 0.5 – 1 mm).

CONNECTING CABLE

• Check that the chain and the front derailleur are in the small chainring position.

• Make sure the shifter cable is fully released (easiest (lowest) gear for front shifter).

• Turn the barrel adjuster on the frame fully into the housing, then turn 1 full turn back.



• Feed the front shifter cable through the cable housing and stops. Route cable through a cable guide beneath the bottom bracket.

• Run the cable under the cable anchor washer and hold taut (**Figure 4**).

• Tighten the 5 mm hex cable anchor bolt to 5 N•m (44 in-lb).

• Shift the chain up and down the chainrings several times to take out initial slack in the cable.

• If necessary, re-tension the cable and tighten cable anchor bolt.

HIGH LIMIT ADJUSTMENT

(see **Figure 6**)

• Set the chain to the smallest rear cog and the large front chainring.

• Adjust the high limit screw so that clearance between the front derailleur cage outer plate and the chain is 0.5 – 1 mm.

RED / FORCE / RIVAL · FRONT DERAILLEURS
ASSEMBLY

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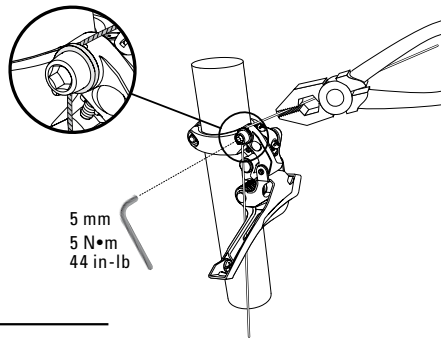

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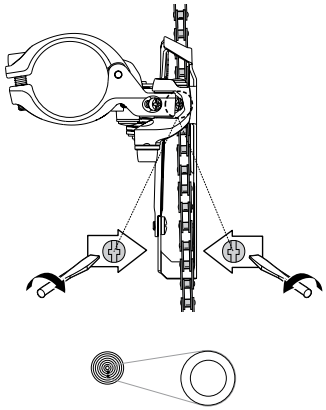

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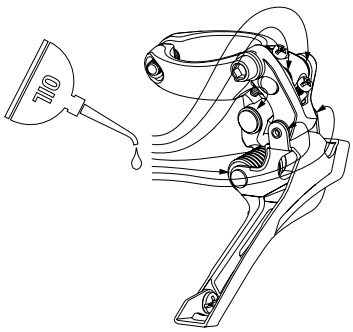


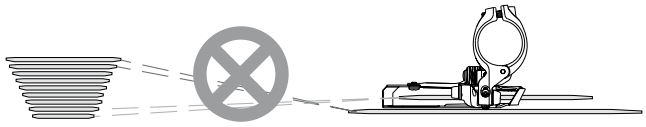
INDEX SHIFTING ADJUSTMENT

(see **Figure 8**)

Adjust the front shifter cable barrel adjuster to ensure the front derailleur contacts the high limit screw when the shifter is indexed to the large chainring position. Shift to and from the large chainring with the chain on several different rear cogs. If shifting performance is not acceptable, re-check the cage alignment (**Figure 3**) and limit screw adjustments (**Figure 4** and **6**), then repeat index shifting adjustment.

ADVICE

Avoid using extreme gear combinations as these combinations cause noise and excessive wear!



TROUBLESHOOTING

Problem	Cause	Remedy
Shifter actuated, chain fails to change chainring.	Shift cable incorrectly clamped.	Check shift cable and correct as necessary (cable clamp; cable housing stops; cable recess in shifter; cable tension).
	High / low limit screw poorly adjusted.	Correct limit screws.
	Clearance between cage and large chainring is too large / small.	Correct position (1 – 3 mm).
Chain falls over large / small chainring.	High / low limit screw poorly adjusted.	Correct limit screws.
Force required to actuate gears is too high.	Excessive cable friction, pinched or poorly routed cable.	Lubricate or replace cable and housing. Check for excessive bending of cable housing.
Crank collides with front derailleur.	High gear limit screw incorrectly adjusted.	Correct high limit screw.
	Cage not parallel with chainring.	Correct the front derailleur position.

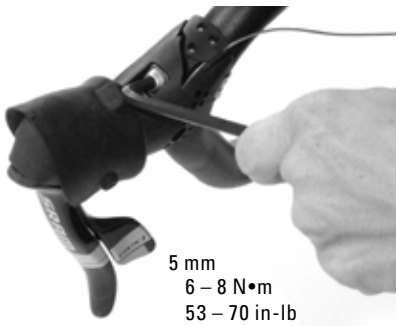
RED / FORCE / RIVAL · DOUBLE TAP SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	Red		Force		Rival	
Version	Double Tap Shifter		Double Tap Shifter		Double Tap Shifter	
Shifter Type	Front	Rear	Front	Rear	Front	Rear
Speeds	2	10	2	10	2	10
Derailleur	SRAM Red / Force / Rival					
Crankset	SRAM Red / Force / Rival					
Brakes	SRAM Red / Force / Rival Dual Pivot Road calipers, Avid Shorty 4/6 cantilevers, Avid BB7 Road and most common road caliper brakes					
Shifter Cable	High quality 1.1 mm shifting cable and 4 or 5 mm compressionless housing, high quality, with non-sealed end caps of maximum diameter 5.8 mm and maximum length 16 mm.					
Brake Cable	1.6 mm high quality brake cable with road-style cable end and brake cable housing with end caps.					
Cable Pull/Release	Double Tap		Double Tap		Double Tap	
Cable	Proprietary Stainless Steel		PTFE Coated Stainless Steel		Stainless Steel	
Reach Adjust	Brake and Shift Lever		Brake and Shift Lever		Brake and Shift Lever	
Gear Indication	None		None		None	
Barrel Adjuster	None		None		None	
Clamping Diameter	22.1 – 22.3 mm		22.1 – 22.3 mm		22.1 – 22.3 mm	

RED / FORCE / RIVAL · DOUBLE TAP SHIFTERS
ASSEMBLY

1

2



Assembly

• Flip hood cover by hand. Slide shifter onto handlebar (**Figure 1**).
Tighten the 5 mm hex clamp bolt to 6 – 8 N•m (53 – 70 in-lb) (**Figure 2**).

• Feed the shifter cables through the cable housings and stops. Make sure the shifter cable is fully released (easiest (lowest) gear for front shifter or the hardest (highest) gear for rear shifter).

• Choose the one shift cable exit which fits best for your handlebar cable routing (**Figure 3**). There is no need to disassemble the shifter. Seat the housing ferrules in the stops. Feed the shift cable into the cable housing end cap using a pick to guide the cable.

• Make sure the shifter cable is fully released (easiest (lowest) gear for front shifter or the hardest (highest) gear for rear shifter).

• Replace hood cover.

• Actuate brake lever. Make sure the countersunk side of the hole is visible. Feed the new cable through the cable holder, cable housing and cable stops. Pull the cable snug. Make sure that the cable end is firmly seated in the cable holder (**Figure 4**).

• Attach the front/rear shifter cable to the front/rear derailleur and adjust indexing per derailleur instructions. Attach the front/rear brake cable to the front/rear brake and adjust per brake instructions.

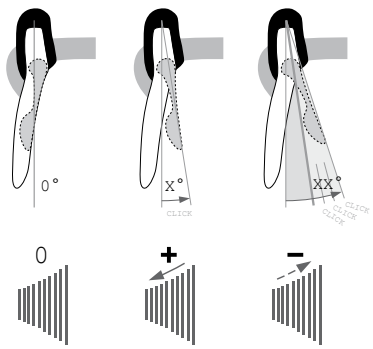
CAUTION
Always check the front and rear brake levers for proper operation.

3

4

RED / FORCE / RIVAL · DOUBLE TAP SHIFTERS
USE

1



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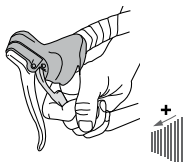
USE

SHIFTER

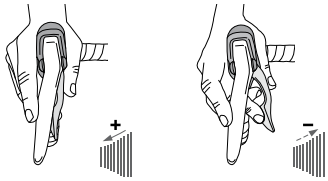
- Move the small shift lever inward slightly and an upshift to a harder (higher) gear is initiated **(Figure 1)**. Push the same lever farther inward and you're shifting up to three shifts to easier (lower) gears **(Figure 1)**.

The shifters also offer specific operations:

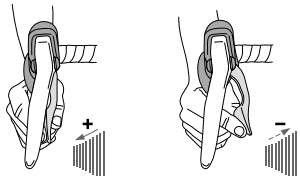
- Upshifting while sprinting:



- Shifting from the hoods:



- Shifting from the drops:



- The left hand shifter offers a trim function for the front derailleur to avoid chain rub in extreme positions.
  From the small chainring position, the first shift changes to the large chainring position. From the large chainring position, a slight release changes to the large chainring trim position. Alternately, a big release changes to the small chainring position.

BRAKE LEVER

CAUTION
Always check the front and rear brake levers for proper operation!

REACH ADJUST

Set the reach adjust on the shift lever first then adjust the brake lever until the brake lever bumper just touches the shift lever. This will ensure the brake lever does not interfere with the return action of the shift lever.

- Move the shift lever inboard to expose the reach adjust cam. **(Figure 2)**
- Push the cam in and turn counterclockwise to move the shift lever closer to the handlebar. It may be helpful to use a pick. The shift lever has 6 different adjustment positions.
- Pull back hood cover by hand. **(Figure 3)**
- Use the small 3mm hex bolt to set the reach adjust of the brake lever. Turn the bolt clockwise to move the brake lever closer to the handlebar until the brake lever bumper just touches the shift lever. **(Figure 4)**

CAUTION
Always check the front and rear brake levers for proper operation!

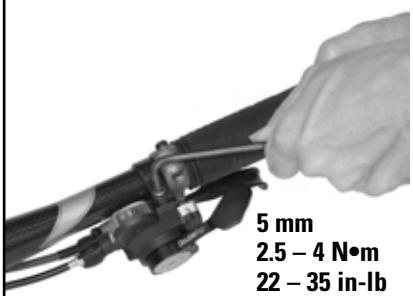
DOUBLE TAP FLAT BAR SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

Version	Double Tap Flat Bar Shifter			
Shifter Type	Front		Rear	
Speeds	2	3	10	9
Derailleur	SRAM Red / Force / Rival	SRAM and Shimano®	SRAM Red / Force / Rival	SRAM 9 Speed (1:1 Actuation Ratio)
Shifter Cable	High quality 1.1 mm shifting cable and 4 or 5 mm compressionless housing, high quality, with non-sealed end caps of maximum diameter 5.8 mm and maximum length 16 mm.			
Brake Cable	1.6 mm high quality brake cable with road-style cable end and brake cable housing with end caps.			
Cable Pull/Release	Double Tap			
Cable	Proprietary Stainless Steel			
Reach Adjust	Brake and Shift Lever			
Gear Indication	None			
Barrel Adjuster	None			
Clamping Diameter	22.1 – 22.3 mm			

DOUBLE TAP FLAT BAR SHIFTERS
ASSEMBLY

1

2



INSTALLATION

• Slide shifter onto handlebar, and then slide on brake lever. Slide the handlebar grip onto the handlebar (**Figure 1**).

CAUTION

Never use lubricants or solvents to install handlebar grips. Handlebar grips provide an axial safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off the handlebar.

• Choose the best shifter and brake lever position for your ergonomic needs.

• Tighten the 5 mm hex clamp bolt to 2.5 – 4 N•m (22 – 35 in-lb) (**Figure 2**).

• Tighten the brake lever clamp bolt to the manufacturer's recommended torque specification.

• Feed the cable through the cable housing and stops. Make sure the shifter is in the fully released position (lowest gear position (front shifter) or the highest gear number (rear shifter)).

• Attach the front/rear shifter cable to the front/ rear derailleur.

• Adjust indexing per derailleur instructions.

CAUTION

Always check the front and rear brake levers for proper operation. If there is interference between a shifter and a brake lever, rotate one out of the way. Check for proper brake lever operation again!.

DOUBLE TAP FLAT BAR SHIFTERS
USE / MAINTENANCE

USE

• Push the shift lever inward slightly and an upshift to a harder (higher) gear is initiated.Push the same lever farther inward and you're shifting up to three shifts to easier (lower) gears.

10 SPEED ONLY: The left hand shifter offers a trim function for the front derailleur to avoid chain rub in extreme positions. The lever has three positions: small chainring, trim, and large chainring. From the small chainring position, a short throw changes to the trim position, a long throw changes to the large chainring position. From the trim position, a short throw releases to the small chainring, and a long throw shifts to the large chainring position. From the large chainring position, a short throw shifts to the trim position. A second short throw will shift to the small chainring position.

3

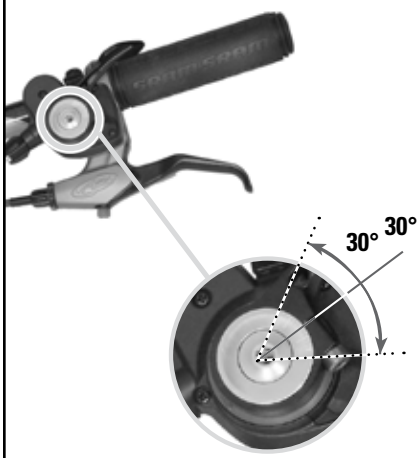
SHIFT LEVER ORIENTATION

• Use a 4 mm hex wrench to loosen the shift lever angle adjustment screw (**Figure 3**).

• Position the shift lever using the angle markings as a guide (**Figure 4**).

• Use a 4 mm hex wrench to torque the shift lever angle adjustment screw to 22 in-lb (2.5 N•m).

4



CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

• The shifter does not need to be opened.

• Use only new, high quality cable and compressionless cable housing with end caps.

• Line-up the shifter in gear position "1" (front shifter) or the highest gear number (rear shifter).

• Detach the cable from the derailleur.

• Cut the cable off 6" (15 cm) from the shifter barrel adjuster. Discard the old cable and cable housing.

• Carefully unscrew cable change cap from cable entry with a screwdriver (**Figure 5**).

• Push cable out of the cable entry with rotating movement (**Figure 6**).

• Feed the new cable through the cable entry and out of the barrel adjuster (**Figure 7**). It may be helpful to remove the barrel adjuster for better visibility.

• Replace cable change cap.

• Feed the cable through the new cable housing and cable stops.

• Attach the cable to the derailleur and adjust indexing per derailleur instructions.

MAINTENANCE

ADVICE
Clean the shifter using only water and mild soap.

These shifters are nearly maintenance free. For any questions regarding methods of disassembly or maintenance, please contact your qualified local dealer.

5

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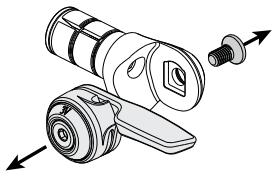
7

TT SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

TT Shifter		
Version	Time Trial Shifter	Time Trial Shifter
Shifter Type	Front (Friction	Rear (Index)
Speeds	2	10
Derailleur	SRAM Red / Force / Rival	
Crankset	SRAM Red / Force / Rival	
Shifter Cable	High quality 1.1 mm shifting cable and 4 or 5 mm compressionless housing, high quality, with non-sealed end caps of maximum diameter 5.8 mm and maximum length 16 mm.	
Bar Inner Diameter	19.2 - 22.5 mm / Minimum depth 35 mm	
Cable	PTFE Coated Stainless Steel	PTFE Coated Stainless Steel
Gear Indication	None	None
Barrel Adjuster	None	None

TT SHIFTERS
ASSEMBLY

1



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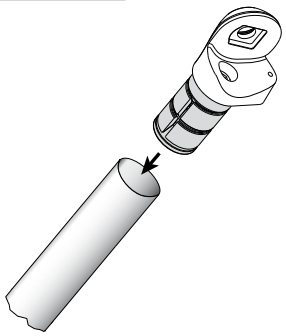

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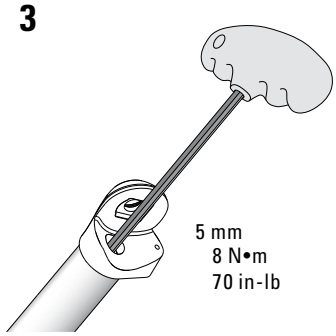


ASSEMBLY

ADVICE

Make sure cable housing length is sufficient to allow for extreme turning angles as well as adjustable handlebars and stems.

• Remove the 4 mm housing screw to separate the shifter assembly from the housing **(Figure 1)**.
note: the shifter assembly will come off as one piece with no loose parts.

• Push the housing into the handlebar extention until it stops **(Figure 2)**.

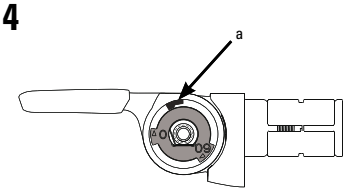
• Tighten the 5 mm internal clamp screw to 8 N•m (70 in-lb) **(Figure 3)**.

• **Front shifter lever only:** When engaged in the big chain ring, the front shifter lever is designed to remain parallel to the ground for three different handlebar positions. The front shifter lever can be set to a "position stop angle" that corresponds to 0°, 30°, or 60° handlebar positions **(Figure 4)**.

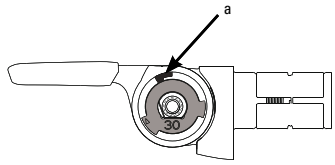
note: the front shifter lever is pre-set from the factory at a 0° position stop angle.

important: the orientation of the position stop washer is **critical** to the function of the shifter lever. Refer to the illustrations above for proper setup of the chosen position stop angle.

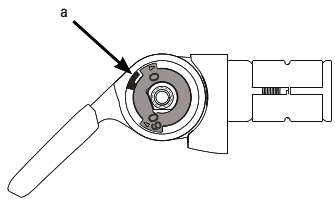
4



0° Position Stop Angle



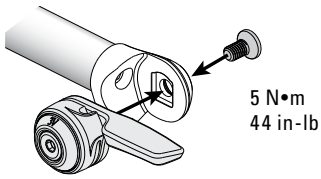
30° Position Stop Angle



60° Position Stop Angle

TT SHIFTERS ASSEMBLY

5



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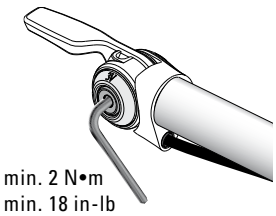

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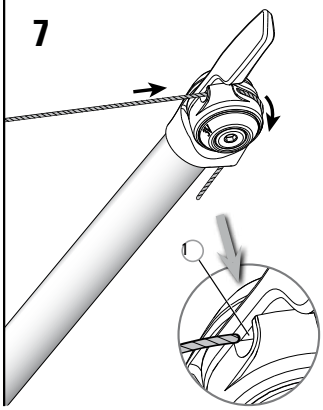


- Fit the shifter assembly back onto the housing and tighten the 4 mm housing screw to 5 N•m (44 in-lb) (**Figure 5**).
- **Front shifter lever only:** torque the friction adjust screw on the front shifter lever to 2 N•m (18 in-lb) minimum (**Figure 6**).

note: to increase the feedback felt at the front shifter lever, you can increase the torque of the friction adjust screw.

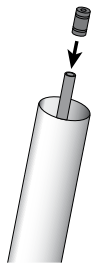
- Feed the new cable through the cable entry (1) and out the shifter (**Figure 7**).
- Feed the new cable through the cable housing and cable stops.
- Pull the cable snug. Make sure that the cable head is firmly seated in the cable holder.
- Attach the cable to the derailleur and adjust indexing per derailleur instructions.

TT BRAKE LEVERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

TT Brake Lever		
Version	Time Trial Brake Lever	Time Trial Brake Lever
Brake Lever	Left	Right
Lever Size	5-Finger	5-Finger
Brake Compatibility	SRAM Red / Force / Rival Dual Pivot Road calipers, Avid Shorty 4/6 cantilevers, Avid BB7 Road and most common road caliper brakes	
Brake Cable	1.6 mm high quality brake cable with road-style cable end and brake cable housing with end caps	
Bar Inner Diameter	19.2 - 22.5 mm / Minimum depth 39 mm	
Reach Adjust	No	No
Pivot Bushing	POM	POM
Housing	Grilon Composite	Grilon Composite
Lever	Carbon Composite	Carbon Composite

TT BRAKE LEVERS
ASSEMBLY

1



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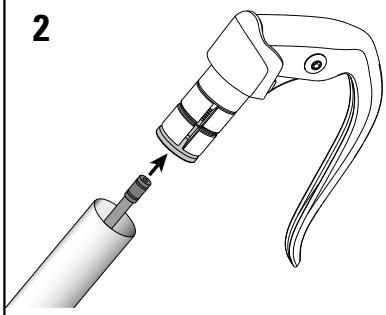

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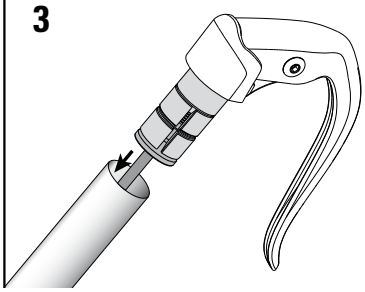


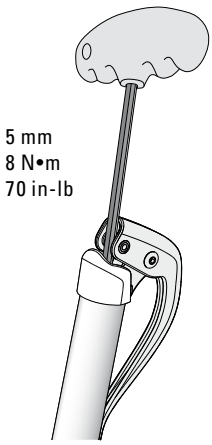
ASSEMBLY

- Push the cable housing end cap onto the brake cable housing **(Figure 1)**.
- Insert the end of the brake cable housing into the brake lever bottom side **(Figure 2)**.
- Push the brake lever onto the handlebar **(Figure 3)**.
- Tighten the brake lever. 5 mm Allen wrench, torque 8 N•m (70 in-lb) **(Figure 4)**.
- Pull the brake handle toward the handlebar and make sure the countersunk side of the hole is visible (1). Feed the new cable through the cable holder (2), cable housing and cable stops **(Figure 5)**.
- Pull the cable snug. Make sure that the cable end is firmly seated in the cable holder.
- Follow the brake manufacturer's instructions when mounting the brake cable and adjusting the brakes.

CAUTION
Before riding, always check that all brake system components are functioning properly.

Check and correct the brake cable tension after each handle change to ensure good brake performance.

4



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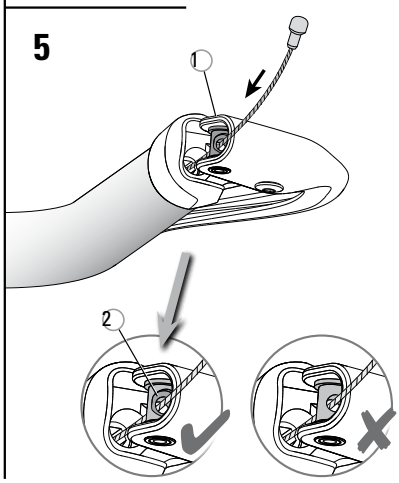


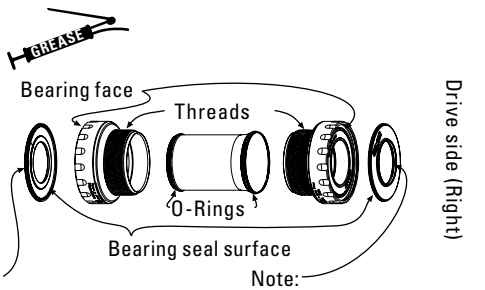
RED / FORCE / RIVAL · CRANKSETS W. GXP BOTTOM BRACKET
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	Red	Red Compact	Force	Force Compact	Rival	Rival Compact
Bottom Bracket Type	GXP External Bearing		GXP External Bearing		GXP External Bearing	
Bottom Bracket Thread	BSA or Italian		BSA or Italian		BSA or Italian	
Bolt Circle Diameter	130 mm	110 mm	130 mm	110 mm	130 mm	110 mm
Chainring Ratio	53 / 39 T	50 / 34 T	53 / 39 T	50 / 34 - 50 / 36 T	53 / 39 T	50 / 34 - 50 / 36 T
Chains	**Only compat. with** SRAM 10 speed chains		SRAM 10 speed chains and Shimano® 10 speed chains			
Chainline	44.5 mm		44.5 mm		44.5 mm	
Minimum Chainstay	405 mm		405 mm		405 mm	
Crank Lengths	165 / 167.5 / 170 / 172.5 / 175 / 177.5		170 / 172.5 / 175		165 / 170 / 172.5 / 175 / 177.5 / 180	
Bearing	Ceramic Sealed Cartridge Bearing		Sealed Cartridge Bearing		Sealed Cartridge Bearing	
Bottom Bracket Cup	Forged Alloy		Forged Alloy		Forged Alloy	
Crank Arm	Carbon Fiber		Carbon Fiber		AL 6066 Aluminum	
Chainring	7075-T6 Aluminum		7075-T6 Aluminum		7075-T6 Aluminum	
Chainring Bolts	7075-T6 Aluminum		7075-T6 Aluminum		7075-T6 Aluminum	

Cranks are only compatible with GXP bottom brackets and Powerglide chainrings by Truvativ.

RED / FORCE / RIVAL · CRANKSETS W. GXP BOTTOM BRACKET
ASSEMBLY

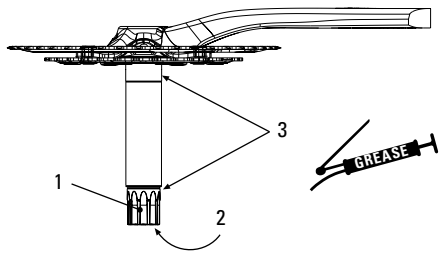
1



Note:
Non-drive side bearing seal has smaller inner diameter than drive-side seal

Note:
Drive side bearing seal has larger inner diameter than non-drive side seal

2



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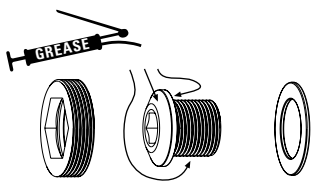


NECESSARY TOOLS

- Torque wrench
- 8 mm hex, 16 mm (5/8") hex
- Bottom Bracket installation tool (Truvativ GXP tool, Park™ BBT9 or equivalent)

Supplies:
- Grease

PARTS PREPARATION

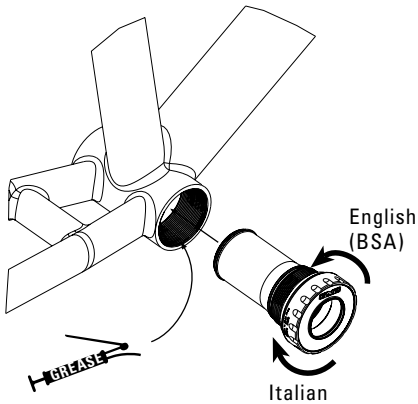
- Assure the frame's bottom bracket shell threads are clean and undamaged, there should be no paint or dirt present. Have your bottom bracket shell chased and faced by your bike shop for best results. Check to make sure the threads of your GXP bottom bracket match the threads in the bottom bracket shell of your frame.
- Prepare the bottom bracket as shown in **Figure 1**. It may be necessary to remove the drive side seal from the spindle. Both seals should be pressed into place so that the outer lip seats firmly in the bottom bracket cup groove. Apply grease to the surfaces shown in **Figure 1**.
- Prepare the crank spindle:
  – Apply grease to splines (**1**, **Figure 2)**
  – Apply grease to crankbolt threads (**2**, **Figure 2**)
  – Apply grease to spindle bearing race surfaces (**3**, **Figure 2**)
- Prepare the self extracting crank bolt: Apply grease to the surfaces shown in **Figure 3.**

ASSEMBLY

- Grease frame threads **(Figure 4)**. Thread the prepared bottom bracket into the drive side (right side) of the frame (counterclockwise to tighten English (BSA) thread or clockwise to tighten Italian thread) until the flange bottoms against the frame shell face.
  Torque to 34 – 41 N•m (301 – 363 in-lb) using a torque wrench. Refer to **Figure 4.**
- Grease frame threads **(Figure 5)**. Thread the prepared left adapter cup into the non-driveside (left side) of the frame (Clockwise to tighten) until the flange bottoms against the frame shell face. Torque the left adapter cup to 34 – 41 N•m (301 – 363 in-lb) using a torque wrench.
- Grease the inner bearing races as shown in **Figure 6.** Slide the right crankarm and spindle assembly through the bottom bracket until the left side splines come through the left side bottom bracket cup, and the spindle stops.
- If the crank bolt assembly has not been assembled yet, assemble it and torque as shown in **Figure 7.** Use a 16 mm hex (5/8") and torque wrench to install self

RED / FORCE / RIVAL · CRANKSETS W. GXP BOTTOM BRACKET ASSEMBLY

4



34 – 41 N•m
(301 – 363 in-lb)

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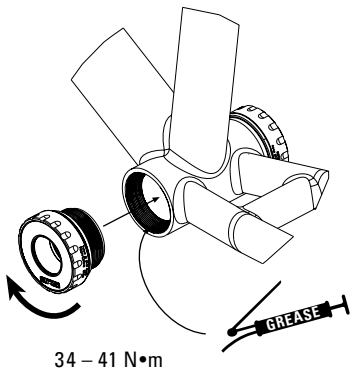

34 – 41 N•m
(301 – 363 in-lb)

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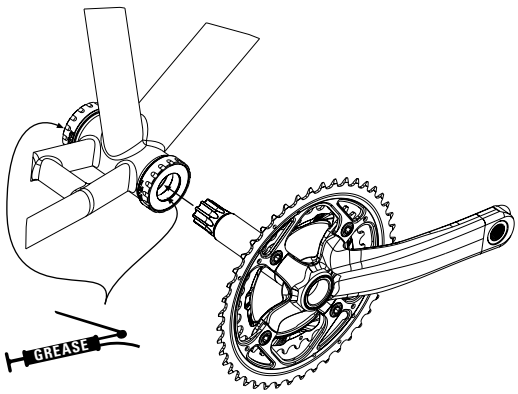
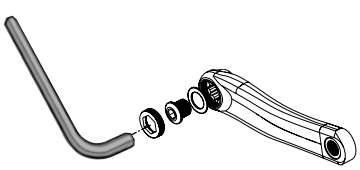


7

16 mm (5/8")
12 – 15 N•m
106 – 133 in-lb



extractor and torque to 12 – 15 N•m (106 – 133 in-lb).

• Assemble the left crankarm onto the bottom bracket spindle using an 8 mm hex and torque wrench and torque to 48 – 54 N•m (425 – 478 in-lb) as shown in **Figure 8.**

• Check the assembly for play by rocking the crank arms back and forth away from frame. If the crank moves, tighten crank arm bolt until no play is detected. If maximum torque of 54 N•m (478 in-lb) has been achieved, remove the crank arm from the spindle, apply additional grease and repeat installation proceedures until play is eliminated.

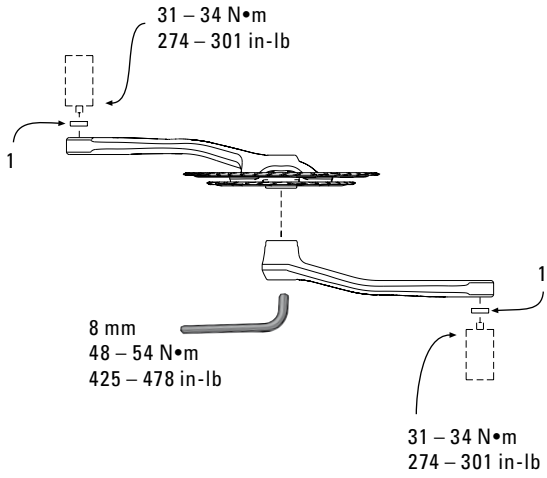
• Grease the pedal threads, assemble and tighten the pedals to the crankarms with 31 – 34 N•m (274 – 301 in-lb). Use the included pedal washers (1, **Figure 8)** if the pedal contact surface is not flat and smooth.

C A U T I O N
Drivetrain side is right hand pedal-thread. Non drive side is left hand pedal-thread.

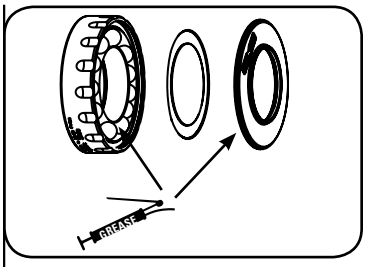
A D V I C E
If creaking of the assembly occurs, check that all parts were torqued to specification, and grease is liberally applied on all surfaces noted. Also check chainring bolts (8 – 9 N•m / 80 – 90 in-lb) and pedals are installed with proper lubrication and torque.

GXP seals are designed to prevent contamination and therefore must rub against their sealing surfaces. New GXP seals will feel stiff upon initial installation. This is normal. With use the seals will wear-in and loosen up.

8



RED / FORCE / RIVAL · CRANKSETS W. GXP BOTTOM BRACKET MAINTENANCE



MAINTENANCE

Wipe out debris from the interior of cage plates and parallelogram linkage. Brush the derailleur with clean or soapy water. Rinse the derailleur with clean water and let air dry. Do NOT use a pressure washer.

ADVICE

Red: The ceramic bottom bracket bearings require regular maintenance. Re-grease bearings using SKF LGHP2 grease after 100 hours of use in dry conditions or immediately following any significant exposure to water (riding in heavy rain, water crossings).

- Remove crankarms according to manufacturer's instructions.
- Using a pick, carefully remove external seals from the face of bottom bracket, and rubber bearing seal from the face of bearing.
- Load SKF LGHP 2 grease into syringe. Apply grease, ensuring that bearings are completely covered, including between bearings.
- Press the rubber bearing seal back into place.
- Apply light coating of grease to the inside surface of the external seal. Press external seals into place so that the outer lip seats firmly in bottom bracket cup groove.
- Wipe away any excess grease with a clean cloth.
- Re-install crankarms according to manufacturer's instructions.

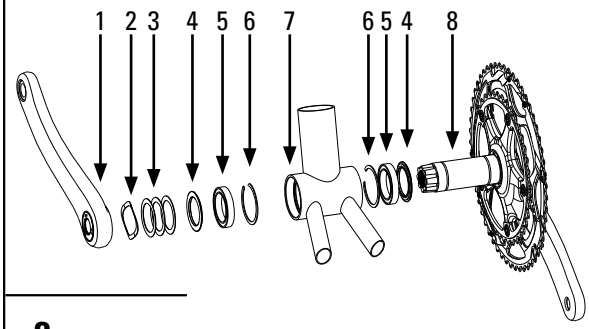
BB30 CRANKSET
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	BB30 Crankset	
Bottom Bracket Type	GXP External Bearing	
Bottom Bracket Thread	N/A	
Bolt Circle Diameter	130 mm	110 mm
Chainring Ratio	53 / 39 T	50 / 34 T
Chains	**Only compat. with** SRAM 10 speed chains	
Chainline	44.5 mm	
Minimum Chainstay	405 mm	
Crank Lengths	170 / 175 / 177.5	
Bearing	BB30 Standard Sealed Cartridge Bearing	
Bottom Bracket Cup	N/A	
Crank Arm	Carbon Fiber	
Chainring	7075-T6 Aluminum	
Chainring Bolts	7075-T6 Aluminum	

BB30 CRANKSET
ASSEMBLY

ANATOMY

1 Non-Drive Side Crank Arm
2 Wave Washer
3 Spacers
4 Bearing Shield
5 BB30 Bearing
6 Retaining Clip
7 Bottom Bracket Shell
8 Drive Side Crank Arm and Spindle



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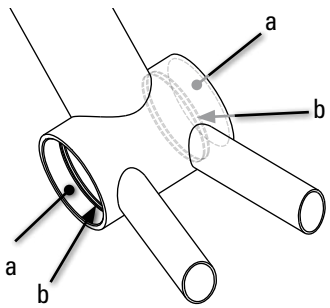


NECESSARY TOOLS

Installation:

- Safety Glasses
- 30 mm Bearing Installation Tool #00-6415-032-020
- 10 mm hex
- Torque wrench
- Headset Press (Park Tool Co. © HHP-2 or equivalent)
- Grease

Removal:

- 30 mm Bearing Removal Tool #00-6415-032-030
- 10 mm Hex
- Flat Bladed Screwdriver
- Rubber Mallet
- Drift Tool

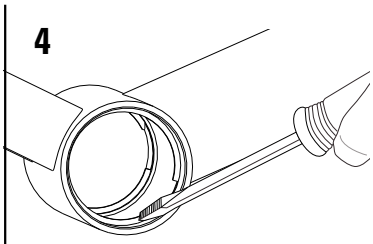
PARTS PREPARATION

- Ensure that bottom bracket shell is clean and free of metal chips, dirt and excess paint.
- Apply a thin layer of grease to the inside surface of the bottom bracket shell (a) and the bottom bracket grooves (b).

ADVICE
It is not necessary to face or machine the bottom bracket shell to use the BB30 system.

BB30 CRANKSET ASSEMBLY

4



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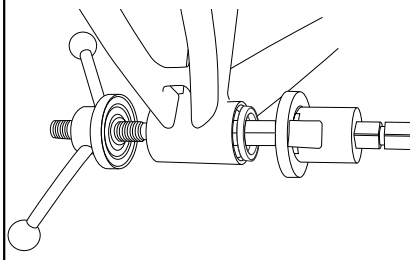

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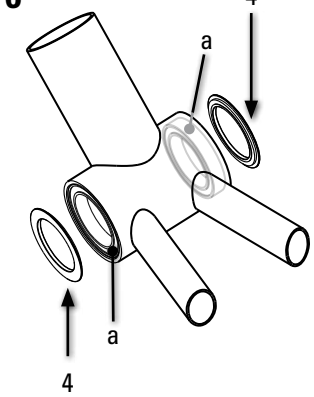

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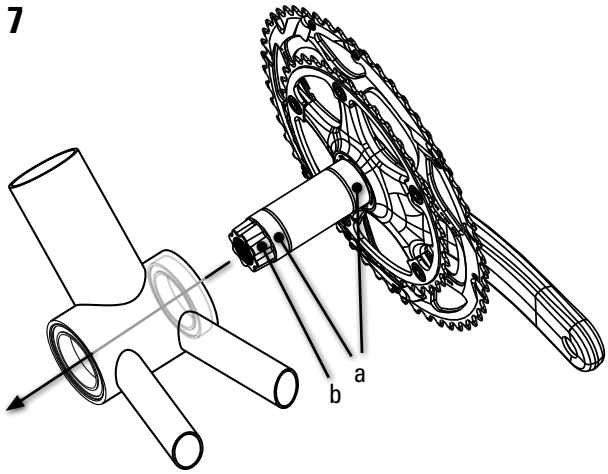

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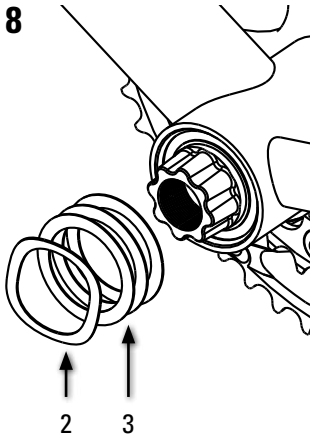

INSTALLATION

WARNING
Wear eye protection during the installation process. The BB30 retaining clips have sharp edges and can cause serious eye injury if they spring from bottom bracket during installation.

• Using a small flat blade screwdriver, gently install the square end of the retaining clip into the bottom bracket groove, then work the retaining clip into the groove until it is fully seated in the groove. Ensure retaining clip is fully seated in groove. Repeat for opposite side.

• Using a headset press, press the drive side bearing into bottom bracket shell until butted against the retaining clip. Repeat process for non-drive side bearing. Consult your headset press manufacturer's instructions for proper use of the headset press.

CAUTION
Attempting to install both bearings simultaneously can damage the bearings and/or frame.

• Apply a thin layer of grease to outer bearing surfaces (a). Place bearing shields over bearings with tiered surfaces facing inward toward the bearings.

• Apply light grease to spindle (a) and spindle splines (b). Gently and completely insert the drive side crank and spindle assembly through the installed BB30 bearings.

• Install plastic spacers and wave spring washer over spindle on non-drive side of bottom bracket.

BB30 CRANKSET ASSEMBLY

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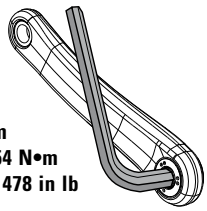
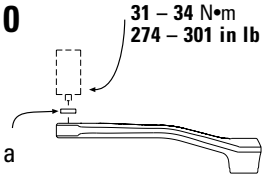


10 mm
48 – 54 N•m
425 – 478 in lb

10



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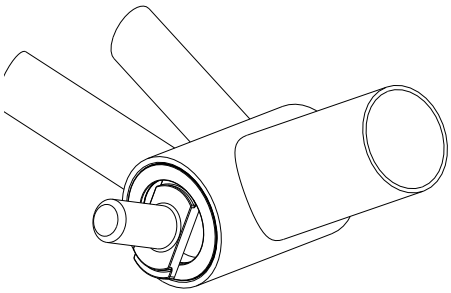

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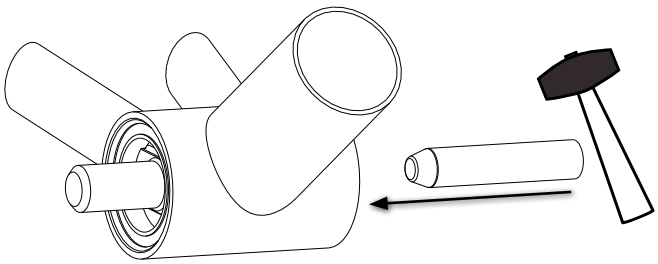


• Apply a thin layer of grease to the threads of non-drive side crank arm. Place the non-drive side crank arm on the spindle and use a 10 mm hex to tighten the crank bolt to 48-54 N•m (425-478 in-lb).

A D V I C E
Wave washer on non-drive side should be compressed but not flattened when crank bolt is at full torque. Adjustments to the number of plastic spacers used may be required.

A D V I C E
Do not attempt to remove self-extracting crank bolt from the non-drive side crankarm. Doing so may damage your crankset.

P E D A L I N S T A L L A T I O N

• Grease pedal threads, install included pedal washers (a), and tighten the pedals to the crank arms with 31 - 34 N•m (274 - 301 in lb).

A T T E N T I O N
Drive side is right hand pedal-threading. Non-drive side is left hand pedal-threading.

M A I N T E N A N C E

Use only water and a mild soap to clean crankset and bottom bracket. Do NOT use a pressure washer.

R E M O V A L

W A R N I N G
Wear eye protection during the installation process. The BB30 retaining clips have sharp edges and can cause serious eye injury if they spring from bottom bracket during installation.

• Using a 10 mm hex, remove non-drive side crank arm from the spindle with self extracting crank bolt (not pictured).

• Remove drive side crankarm and spindle from the bottom bracket. It may be necessary to use a rubber mallet to gently tap the spindle toward the frame to free it (not pictured).

• Tilt BB30 removal tool inward and position so that it is seated on the inside face of the bearing.

• Insert a driver (punch or drift) from the opposite side and place it against the back of the BB30 removal tool. Using a rubber mallet, lightly tap the BB30 removal tool until bearing is removed from the bottom bracket shell. Repeat for other side.

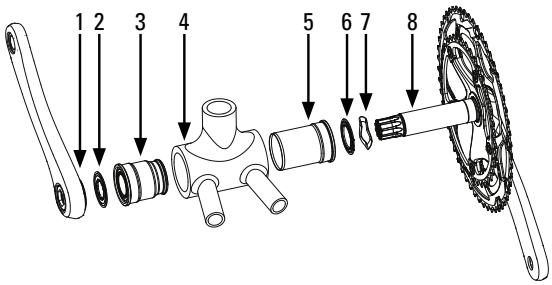
N O T E: do not re-install removed bearings. Always replace with new bearings.

Removal of the retaining clips is unnecessary for bearing replacement unless the retaining clips are damaged. The damaged retaining clip can be removed by using a flat bladed screwdriver to lift the notched section of the retaining clip out of the bottom bracket groove and guiding the retaining clip out of the bottom bracket groove (not pictured).

GXP INTEGRATED BOTTOM BRACKET ADAPTER ASSEMBLY

ANATOMY

1 Non-Drive Side Crank Arm
2 Non-Drive Side Bearing Shield
3 Non-Drive Side Bottom Bracket Cup
4 Bottom Bracket Shell
5 Drive Side Bottom Bracket Cup
6 Drive Side Bearing Shield
7 Wave Washer
8 Drive Side Crank Arm and Spindle



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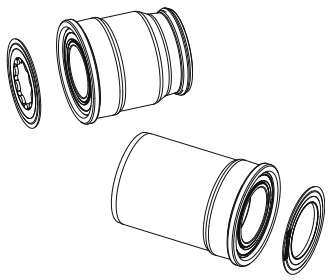

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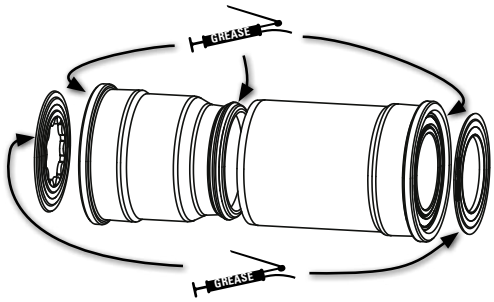

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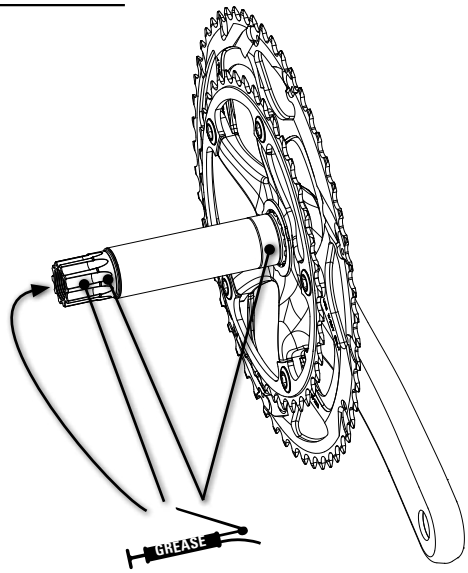

IMPORTANT

To ensure that your GXP Integrated Bottom Bracket Adapter performs properly and to help make your riding experience more enjoyable and trouble-free, we highly recommend that you have it installed by a qualified bicycle mechanic. Installation of the adapter does not have to be permanent. However, repeated removal and re-installation of the adapter could result in damage to the BB Shell and/or adapter cups and is not recommended. The adapter will only work in undamaged frames in good condition. The adapter must NOT be used as a way to repair frames with damaged press fit bottom bracket shells. Improper use, installation or removal of the adapter will void your warranty and can void the warranty for your frame.

NECESSARY TOOLS

Installation:

- Safety Glasses
- 8 mm, 16 mm (5/8") hex
- Torque wrench
- Headset Press (Park Tool Co. © HHP-2 or equivalent)
- Grease
- Pick

Removal:

- 30 mm Bearing Removal Tool #00-6415-032-030
- 10 mm Hex
- Flat Bladed Screwdriver
- Rubber Mallet
- Drift Tool

PARTS PREPARATION

- Carefully remove the bearing shields from the bottom bracket cups. You may need to use a pick to free the shields from the bottom bracket cups..
- Apply grease to the bottom bracket surfaces as indicated.
- Generously apply grease to the the crank spindle as indicated.

GXP INTEGRATED BOTTOM BRACKET ADAPTER ASSEMBLY

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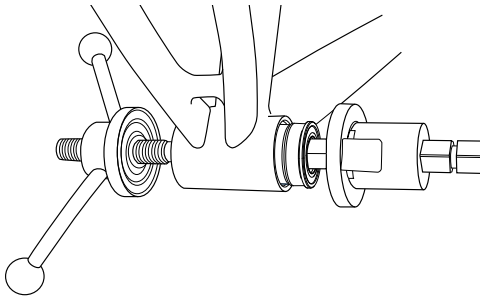

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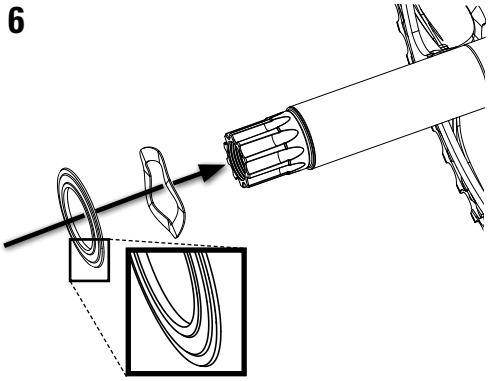

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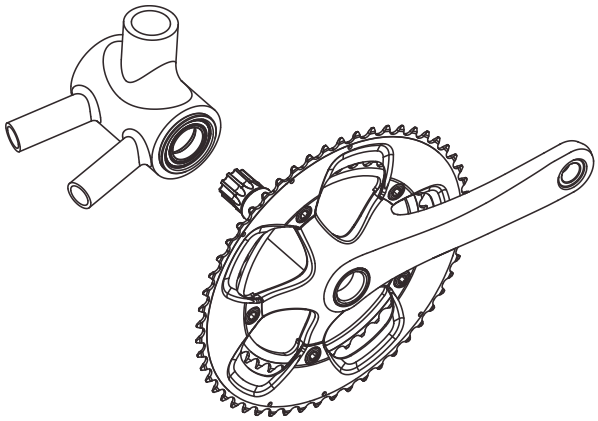

INSTALLATION

ATTENTION
Bearing shields must be removed from the bottom bracket cups prior to installation (step 1).

• Using a headset press, press the drive side bottom bracket cup into bottom bracket shell until bottom bracket cup flange is fully seated against bottom bracket shell. Repeat process for non-drive side bottom bracket cup. Consult your headset press manufacturer's instructions for proper operation of the headset press.

ADVICE
Non-drive side bottom bracket cup has an o-ring pre-installed to distinguish it from the drive side bottom bracket cup.

• Install the wave washer and then the drive side bearing shield onto the spindle, making sure the bearing shield is oriented correctly. The stepped lip on the bearing shield should face the bottom bracket shell.

ADVICE
The drive side bearing shield inner diameter has a circular design. The non-drive side bearing shield inner diameter has a "flower" like design.

• Gently and completely insert the drive side crank assembly spindle through the bottom bracket cups until the non-drive side splines come through the non-drive side bottom bracket cup,and the spindle stops.

• Install the non-drive side bearing shield onto the spindle, making sure the bearing shield is oriented correctly. The stepped lip on the bearing shield should face the bottom bracket shell (not pictured).

• Apply grease to the threads of non-drive side crank bolt. Place the non-drive side crank arm on the spindle and use a 8 mm hex to torque the crank bolt to 48-54 N•m (425-478 in-lb).

Check the assembly for play by rocking the crank arms back and forth away from frame. If the crank moves, tighten crank arm bolt until no play is detected. If maximum torque of 54 N•m (478 in-lb) has been achieved, remove the crank arm from the spindle, apply additional grease and repeat installation proceedures until play is eliminated.

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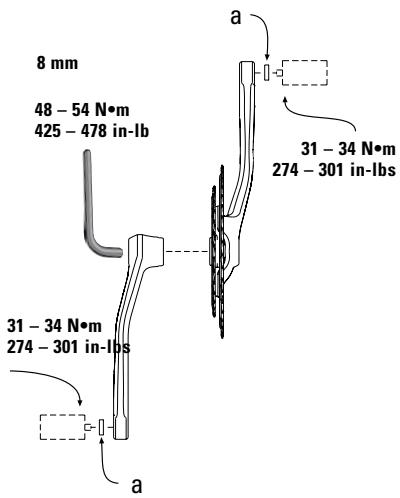
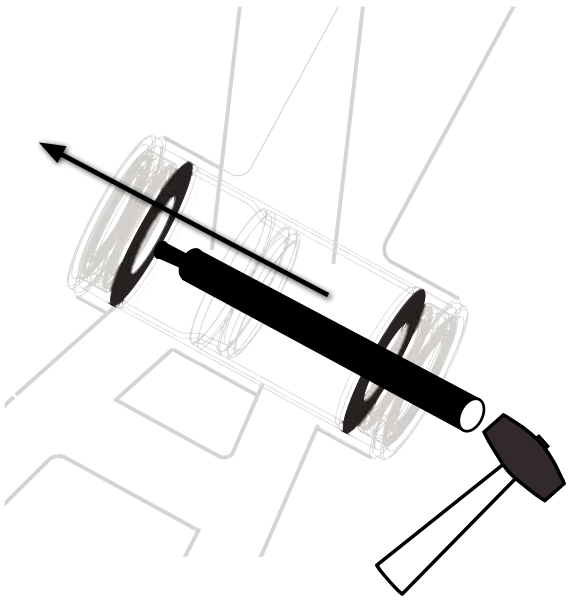


GXP INTEGRATED BOTTOM BRACKET ADAPTER ASSEMBLY / MAINTENANCE

9



PEDAL INSTALLATION

• Grease pedal threads, install included pedal washers (a), and tighten the pedals to the crank arms with 31 - 34 N•m (274 - 301 in lb).

ATTENTION
Drive side is right hand pedal-threading. Non-drive side is left hand pedal-threading.

MAINTENANCE

Use only water and a mild soap to clean crankset and bottom bracket. Do NOT use a pressure washer.

important: use only water and a mild soap to clean crankset and bottom bracket. Do NOT use a pressure washer.

NOTE
If creaking of the assembly occurs, check that all parts are torqued to specification, and grease is liberally applied on all surfaces noted. Verify that chainring bolts are torqued to 8–9 N•m (80–90 in-lb). If creaking continues, consult your local Truvativ dealer for assistance.

ATTENTION
Bearings require regular maintenance. Re-grease bearings after 100 hours of use in dry conditions or immediately following any signicant exposure to water; such as riding in heavy rain or through water crossings.

REMOVAL

• Use the self-extracting crank bolt assembly or crank puller (if applicable) to remove the non-drive side crank arm. Use a rubber mallet to gently tap the end of the crank spindle towards the frame, and slide it out of the bottom bracket. Remove the bearing shields from the bottom bracket cups (not pictured)..

• Use a rubber mallet and 3/16" drift to firmly tap the inner wall of the non-drive side bottom bracket cup. Tap a few times, then reposition the drift in a different location on the inner wall of the bottom bracket cup. Continue this procedure until the cup is removed from the bottom bracket shell. Repeat for the drive side bottom bracket cup.

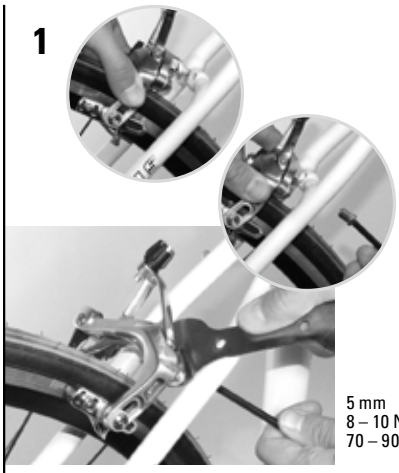
ATTENTION
Use a drift that has smooth edges, without burrs. Be careful not to hit the cartridge bearing inner race while removing the bottom bracket cups from the frame. Doing so could permanently damage the components.

RED / FORCE / RIVAL · DUAL PIVOT ROAD CALIPERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	Red		Force		Rival	
Version	Front	Rear	Front	Rear	Front	Rear
Brake Levers	SRAM Red / Force / Rival Double Tap shifters					
Brake Cable	1.6 mm high quality brake cable with road-style cable end and brake cable housing with end caps					
Brake Pad	Exchangeable		Exchangeable		Exchangeable	
Quick Release	Yes		Yes		Yes	
Barrel Adjuster	Yes		Yes		Yes	
Pivot Bolt	Titanium		Titanium		Stainless Steel	
Arms	Cold Forged Aluminum		Cold Forged Aluminum		Cold Forged Aluminum	

RED / FORCE / RIVAL · DUAL PIVOT ROAD CALIPERS
ASSEMBLY

1

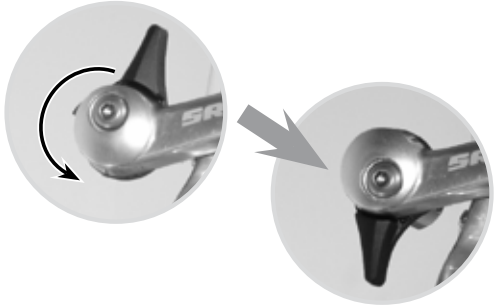


5 mm
8 – 10 N•m
70 – 90 in-lb

2

4 mm
5 – 7 N•m
44 – 62 in-lb

3



ASSEMBLY

Install the brake caliper:

• Hold the brake so it is approximately centered on the wheel, then tighten the brake mounting nut with a 5 mm Allen wrench, tighten to 8 – 10 N•m (70 – 90 in-lb) **(Figure 1)**. For Red calipers, use a 13mm wrench to approximately center the brake on the rim.

Position the brake pads:

• Adjust the brake pad position as shown in **figure 2**. Toe-in, the angle of contact between the pad and the rim, can also be adjusted to optimize braking feel and performance.

• Tighten the brake pad bolt with a 4 mm hex to 5 – 7 N•m (44 – 62 in-lb).

Connect the brake cable:

• Make certain the quick release lever is in the closed position **(Figure 3)**.

• Place the cable in the groove in the cable clamp washer **(Figure 4)**.

• Squeeze the brake caliper until each brake pad is 1 – 1.5 mm from the rim.

• Tighten the cable bolt to 6 – 8 N•m (53 – 70 in-lb).

• Turn the barrel adjuster to reset the shoe clearance (1 – 1.5 mm) **(Figure 5)**.

Center the brake pads:

• **Force / Rival**: Loosen the mounting nut of the caliper brake a bit **(Figure 6)**. Use a 12 mm wrench to precisely center the brake to the rim. Re-tighten the brake mounting nut to 8 – 10 N•m (70 – 90 in-lb).

• **Red**: Turn the brake pad centering bolt with a 3 mm hex until the brake is precisely centered.

Spring Tension Adjustment (Red Only):

The spring tension on the brake caliper can be adjusted to your preference. Bicycles with complicated cable routing may experience increased cable friction and will require higher spring tension for proper function of the brake caliper. Turn the spring tension adjustment screw clockwise with a 2 mm hex to increase spring tension **(Figure 7)**.

Inspection:

Squeeze brake lever hard several times to check that everything is operating correctly, then re-check the brake pad position and clearance to the rim.

RED / FORCE / RIVAL · DUAL PIVOT ROAD CALIPERS ASSEMBLY

4

6 – 8 N•m
53 – 70 in-lb

5

6

Force / Rival
5 mm
8 – 10 N•m
70 – 90 in-lb

7

Red

For Brake Lever information please refer to the Double tap Flat Bar shifters section.

CAUTION
Brakes are a safety-critical item on a bicycle. Improper set-up or use of brakes can result in loss of control or an accident, which could lead to a severe injury. It is your responsibility to learn proper braking techniques. Consult the user manual for your bicycle and a professional bike dealer. Practice your riding and braking techniques on a flat and level surface prior to aggressive riding.

The effectiveness of braking is dependent on many conditions over which SRAM has no control including the speed of the bicycle, type and condition of the riding surface, braking lever force, proper installation and maintenance of brakes, cables, levers, brake pads, the condition of the bike, weight of the rider, braking technique, weather, and a variety of other factors. Remember, it takes longer to stop in wet conditions.

SRAM brakes and levers are not intended for use on any motorized bicycle or vehicle. Any such use could result in a serious personal injury.

Inspect your brakes regularly for damage, and always inspect them thoroughly after any crash or severe impact. If you detect damage, please have your brakes inspected by a professional bike dealer.

Follow these instructions carefully. If you do not understand the instructions, have the installation done by a professional bike mechanic.

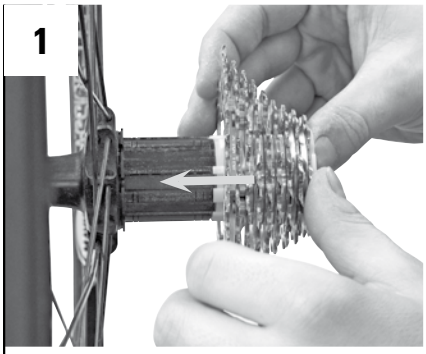
ADVICE
SRAM's standard road brake pads are optimized for aluminum rims. If used with ceramic-coated or carbon rims, use alternative brake pads specifically suited for these rim materials and inspect them often as they may wear quickly.
If the brake pads are worn until the grooves disappear, replace them with new pads.

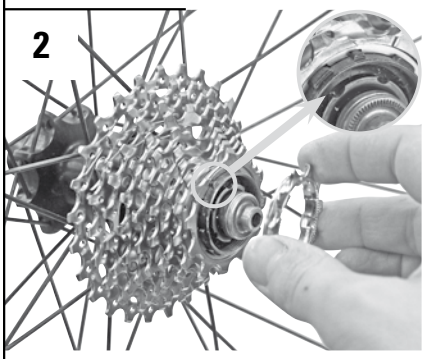
CASSETTES · 10 SPEED ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

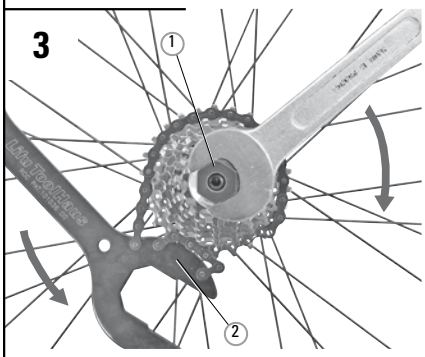
Application	Road			
Technology	Open Glide			
Ratio	11-23 / 11-25 / 11-26 / 11-28			
Speeds	10			
Chains	SRAM 10 speed Power Chains and Shimano® 10 speed chains			
Hubs	Any hub with Shimano® compatible driver body (not compatible with Shimano® DURA-ACE deep-spline 10 speed cassette bodies)			
Cogs	11/12/13/14/15/16/17/19/21/23	11/12/13/14/15/17/19/21/23/25	11/12/13/14/15/17/19/21/23/26	11/12/13/14/15/17/19/22/25/28
Lockring Torque	40 N•m			
Cog Material	Chromium Molybdenum steel, heat treated			
Spider	N/A			
Lockring	Aluminum, anodized			
Rivets	N/A			
Finish	Electroless nickel / anodized back plate and lockring			

Application	Road			
Technology	Open Glide			
Ratio	11-23, 11-25, 11-26, 11-28, 12-25, 12-26, 12-27			
Speeds	10			
Chains	SRAM 10 speed Power Chains and Shimano® 10 speed chains			
Hubs	Any hub with Shimano® compatible driver body (not compatible with Shimano® DURA-ACE deep-spline 10 speed cassette bodies)			
Cogs	11/12/13/14/15/16/17/19/21/23	11/12/13/14/15/17/19/21/23/25	11/12/13/14/15/17/19/21/23/26	11/12/13/14/15/17/19/22/25/28
	12/13/14/15/16/17/19/21/23/25	12/13/14/15/16/17/19/21/23/26	12/13/14/15/16/17/19/21/24/27	
Lockring Torque	40 N•m			
Cog Material	Heat treated steel			
Spider	Aluminum 6061			
Lockring	Aluminum, anodized			
Rivets	Stainless steel			
Finish	Pearl Ni-Chrome plated			

CASSETTES · 10 SPEED ROAD
ASSEMBLY







A S S E M B L Y
The sprockets are arranged on a plastic support (Speedloader).

- Remove the transportation lock.
- Versions with sprockets with 11 teeth: Remove the lockring from the front and the sprocket with 11 teeth from the back of the Speedloader.
- Versions with sprockets with 12 teeth: Remove the lockring from the Speedloader.
- Align the spline patterns of the Speedloader with the driver of the hub and press the Speedloader against the driver **(Figure 1).**
- Check you driver body for damage caused by previous cassettes. Carefully remove any burrs before installation.
- Push the cassette from the Speedloader onto the driver of the hub.

A D V I C E
The thin aluminum tube captured inside the OG-1090 cassette between the cogs and the red aluminum backing plate is designed to have a small amount of movement before installation. After installation, the aluminum tube is squeezed between the cogs and backing plate and forms a water-tight seal. The tube also provides structural erinforcement to the entire cassette - do not remove!

- Only versions with sprockets with 11 teeth: Position the sprocket with 11 teeth on the driver **(Figure 2).**
- Screw the lockring into the driver. Use a mounting tool (**1**, **Figure** 3) (Park Tool® FR-5 or Shimano®) and a chain wrench (**2**, **Figure** 3). Tightening torque 40 N•m (350 in-lb) **(Figure 3).**

A D V I C E
Be careful not to damage the thread of the lockring by tilting.

After installing the rear wheel adjust the rear derailleur per derailleur instructions.

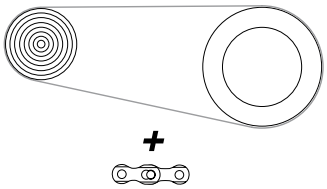
POWER CHAINS · 10 SPEED ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	PC 1090R	PC 1090	PC 1070	PC 1050	PC 1030
Application	Road	Road	Road	Road	Road
Max. Number of Sprockets	10 only	10 only	10 only	10 only	10 only
Compatibility Front	Truvativ / HG / EXA-Drive	Truvativ / HG / EXA-Drive	Truvativ / HG / EXA-Drive	Truvativ / HG / EXA-Drive	Truvativ / HG / EXA-Drive
Compatibility Rear	SRAM OG / HG / EXA-Drive	SRAM OG / HG / EXA-Drive	SRAM OG / HG / EXA-Drive	SRAM OG / HG / EXA-Drive	SRAM OG / HG / EXA-Drive
Dimensions	1/2" x 11/128"	1/2" x 11/128"	1/2" x 11/128"	1/2" x 11/128"	1/2" x 11/128"
Length	5.87 mm	5.87 mm	5.87 mm	5.95 mm	5.95 mm
Riveting	Cylindrical	Cylindrical	Cylindrical	Flat Cylindrical	Flat Cylindrical
Chrome Hardened	Yes	Yes	Yes	Yes	Yes
Push Power	2000 N / 450 lbs.	2000 N / 450 lbs.	2000 N / 450 lbs.	2000 N / 450 lbs.	2000 N / 450 lbs.
Min. Tensile Strength	9000 N / 2023 lbs.	9000 N / 2023 lbs.	9000 N / 2023 lbs.	9000 N / 2023 lbs.	9000 N / 2023 lbs.
External Pin Plate	Silver / Nickel Plated	Silver / Nickel Plated	Silver / Nickel Plated	Silver / Nickel Plated	Silver / Nickel Plated
Internal Pin Plate	Silver / Nickel Plated	Silver / Nickel Plated	Grey	Silver / Nickel Plated	Grey
Connecting Method[1]	Power Lock 10 Speeds	Power Lock 10 Speeds	Power Lock 10 Speeds	Power Lock 10 Speeds	Power Lock 10 Speeds

[1] **Caution:** Connecting method: with Power Lock only (no pin)!

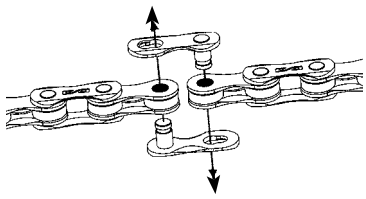
POWER CHAINS · 10 SPEED ROAD ASSEMBLY

1



(1 Link + Power Lock)

2



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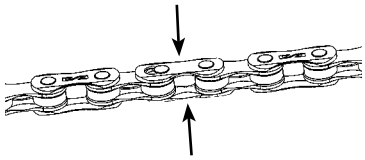

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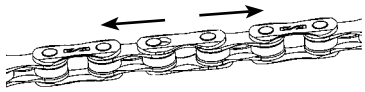

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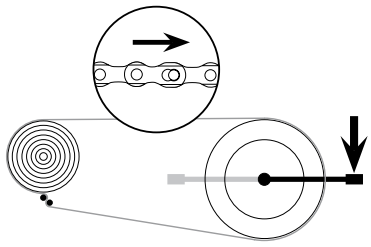


PC 1090R / PC 1090 / PC 1070 / PC 1050 / PC 1030 (1/2" X 11/128")

CHAIN LENGTH:

(A chain tool will be required to shorten the chain.)

• Replacing a worn chain:
Measure the worn chain and shorten the new chain to the same length.

• Initial assembly:
Shorten the chain to the length specified by the derailleur manufacturer.
SRAM derailleurs:
place the chain over largest front chainwheel and largest rear sprocket and add 1 link + Power Lock **(Figure1)**.

CLOSING CHAIN WITH POWER LOCK

CAUTION
Use Power Lock only with SRAM chains!
Use only Power Lock to close 10 speed chains (no Pin)!

Use only Power Lock (black coloured) for PC 1090R, PC 1090, PC 1070, PC 1050, PC 1030 to avoid material damage or the rider to fall off his bicycle resulting in injury.

• Fit chain, insert both halves of the Power Lock into the chain ends **(Figure 2)** and bring the ends together **(Figure 3)** on the bottom side of the drivetrain (no tension side).

• Pull chain apart until you feel some resistance **(Figure 4).**

• Rotate the chain so the Power Lock is positioned on the top side of the drivetrain **(Figure 5).**

• Pedal forward while holding bike firmly in place **(Figure 5)** until you hear click sound. The Power Lock is now in place and safely closed.

OPENING

Once the Power Lock is installed it can only be removed by means of a Chain tool.

CAUTION
Power Lock is for one-time use only!

Always use a new Power Lock when fitting a new chain.

Failure to shorten the chain properly or to lock it exactly into place may cause damage to the chain and eventually total chain failure, material damage or the rider to fall off his bicycle resulting in injury.

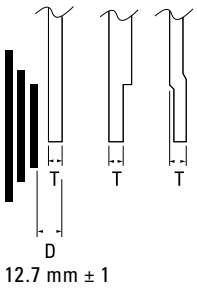
Worn sprockets should also be replaced when a new chain is fitted.

X.0 / X-9 / X-7 / X-5 / X-4 / 3.0 · REAR DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	X.0			X-9		X-7		X-5		X-4		3.0
Speeds	9/8			9/8		9/8		9/8		8/7		8/7
Shifter Compatibility	SRAM 1:1 Actuation Ratio 9/8 speed shifters									SRAM 1:1 8/7spd shifters		
Cogsets and Chains	SRAM / HG 9/8 speed									SRAM / HG 8/7 speed		
Chainrings	22-32-42/44, 24-34-46, 26-36-46/48											
Total	45 T	37 T	30 T	45 T	37 T	45 T	37 T	45 T	37 T	45 T	37 T	45 T
Cage Length	Long	Medium	Short	Long	Medium	Long	Medium	Long	Medium	Long	Medium	Long
Max Sprocket	34 T											
Min Sprocket	11 T											
Front Difference	22 T											
Parallelogram Spring	Titanium			Steel		Steel		Steel		Steel		Steel
Pulleys	Cartridge bearing, stainless			Cartridge bearing, bushing, hardend		Bushing, hardend		Bushing		Bushing		Bushing
Direct Mount	Yes											
Cable and Housing	1.1 or 1.2 mm high quality cables, 4 or 5 mm compressionless cable housing with end cap / maximum diameter of 5.8 mm											
B-Knuckle	Forged Aluminum 7075 T6			Forged Aluminum 6061 T6		Aluminum		Aluminum		Aluminum		Composite
Outer Link	Forged Aluminum			Aluminum die-cast / Painted		Aluminum die-cast / Painted		Aluminum		Zinc Alloy		Composite
Inner Link	Aluminum CNC machined			Aluminum CNC machined		Steel / E-coat		Steel / E-coat		Composite		Steel
Outer Cage	Carbon Composite			Stamped AL / Anodized		Stamped AL / Anodized		Steel / E-coat		Steel / E-coat		Steel / E-coat
Inner Cage	Forged Aluminum 7075 T6			Stamped AL / Anodized		Steel		Steel		Steel		Composite
Hanger Bolt	Aluminum / Anodized			Aluminum / Anodized		Aluminum / Anodized		Steel		Steel		Steel

X.0 / X-9 / X-7 / X-5 / X-4 / 3.0 · REAR DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

1



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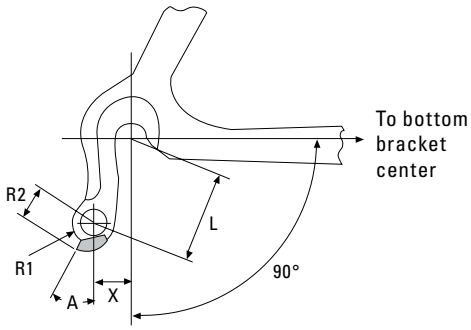
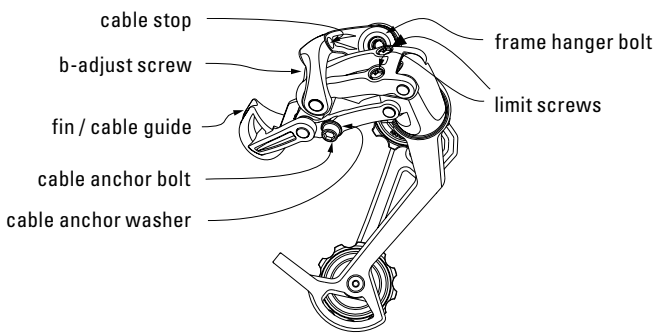


DERAILLEUR ANATOMY



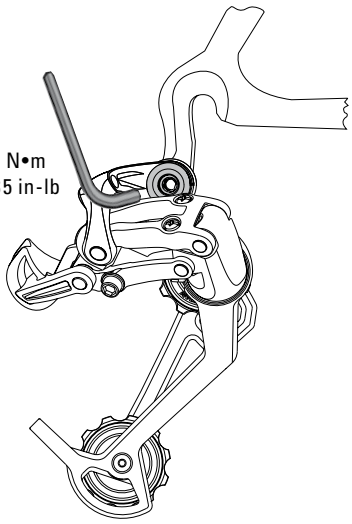
Frame Dimensions
(see **Figure 1** and **2**)

- For optimal 1:1 Actuation Ratio rear derailleur performance, the recommended rear derailleur hanger length (L) should be 28 – 30 mm.
- For a given L, use the chart below to determine other 1:1 Actuation Ratio rear derailleur hanger specifications.

L	X	A	R1	R2	T
28	6 - 10	25° – 30°	8.5 max	11.5 – 13.5	7 – 8
30	7.5 – 10	25° – 30°	8.5 max	11.5 – 13.5	7 – 8

X.0 / X-9 / X-7 / X-5 / X-4 / 3.0 · REAR DERAILLEURS ASSEMBLY

1



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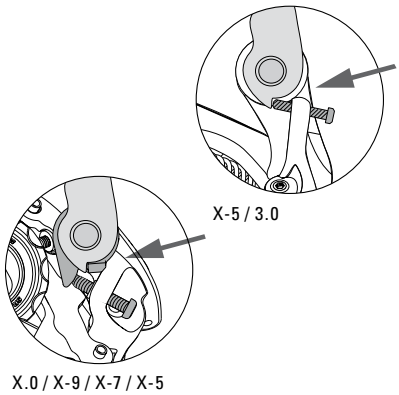

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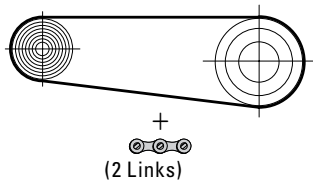

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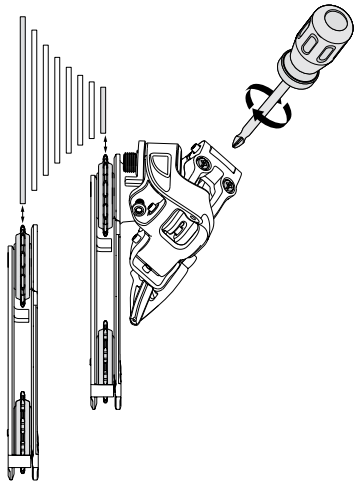


ASSEMBLY

ADVICE
Check the rear derailleur hanger alignment. A bent rear derailleur hanger will result in inaccurate index shifting. Outboard side impacts are the most common causes of this type of damage.

• Attach the rear derailleur to the frame's rear derailleur hanger using a 5 mm hex wrench **(Figure 1)**.

• Check that the b-adjust washer tab (b-adjust screw) is clear of the rear derailleur dropout tab **(Figure 2)**.

• Tighten the 5 mm hex hanger bolt to 8 – 10 N•m (70–85 in-lb) **(Figure 1)**.

CHAIN LENGTH

A properly measured chain will prevent damage in case of accidentally shifting to the largest chain ring and cog combination. This type of accidental shifting may cause harmful binding or seizure of the chain and potentially cause severe damage.

• Bypassing the rear derailleur, run the chain around the largest cog/large chainring combination **(Figure 3)**.

– For rear suspension frames, position the rear suspension for the greatest chain length required.

• Add 2 LINKS or 1 link + Connecting Link to this length for proper chain length.

LIMIT SCREWS ADJUSTMENT

• View the rear derailleur and pulleys from behind the rear of the bicycle **(Figure 4)**.

• Turn the limit screw marked 'H' on the outer link of the derailleur to align the upper guide pulley center with the outboard edge of the smallest cog – clockwise moves the guide pulley inboard towards the wheel.

• While turning the crank, push the rear derailleur towards the larger cogs by hand.

• Align the upper guide pulley under the largest cog, center to center, by turning the limit screw marked 'L' on the outer link – clockwise moves the guide pulley outboard away from the spokes.

CHAIN GAP ADJUSTMENT

Chain gap is the distance between the upper guide pulley and the cog the chain is riding on. Optimal chain gap is small enough to allow quick, efficient shifts to and from any cog, but large enough to allow smooth shifts to and from the largest cog.

• Shift chain to the small chain ring.

• While turning the crank, push the rear derailleur inboard by hand to the largest cog.

• Hold the derailleur in this position while making the following adjustment.

• Using a 2.5 or 3 mm hex (screw driver for X-5), turn the b-adjust screw until the chain gap equals approximately 6 mm ($^1/_4$") from tip of the cog to tip of upper guide pulley **(Figure 5)**.
– Turn the b-adjust screw clockwise to increase the chain gap.
– Turn the b-adjust screw counterclockwise to decrease the chain gap.

ADVICE
Bicycles equipped with an 11-28 cassette may require you to set the chain gap at the smallest cog. This is due to the shallow angle of the cassette in relation to the steeper movement of the 9 speed rear derailleur.

It is best to measure the rear piece of cable housing between the frame and derailleur after the chain gap is determined. See figure and chart for recommended lengths.

Do not use the b-adjust screw to adjust the rear derailleur to act as a chain-
tensioning device or to prevent chain suck. This increases the chain gap causing poor shifting performance.

INDEX SHIFTING ADJUSTMENT

• Check that the chain and the rear derailleur are in the smallest cog position.

• Measure and cut the rear piece of cable housing. Make sure that it is not too short or long **(see figure and chart).**

• Rotate the rear shifter until the largest number and gear indication tab/dash line up.

• Turn the rear shifter barrel adjust clockwise fully into the shifter, then turn counterclockwise 1 full turn.

• Feed the rear shifter cable through the rear derailleur cable housing, stops and cable guides.

• Feed the rear derailleur cable through the rear derailleur-housing stop and through the cable guide on the fin.

• Pull the cable tight and position it under the cable anchor washer **(Figure 6)**.

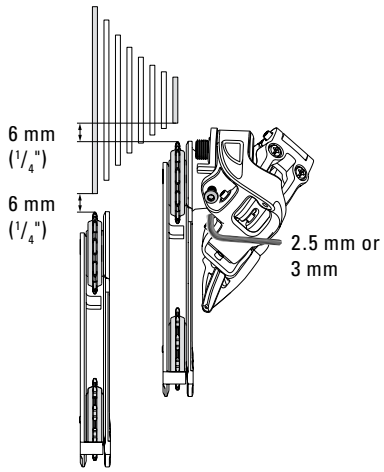
• Tighten the 5 mm hex cable anchor bolt to 4 – 5 N•m (35 – 45 in-lb).

• Rapidly shift the chain and derailleur up and down the cassette several times. If the cable slips repeat the two former steps.

• Shift the chain to the smallest cog.

X.0 / X-9 / X-7 / X-5 / X-4 / 3.0 · REAR DERAILLEURS ASSEMBLY

5



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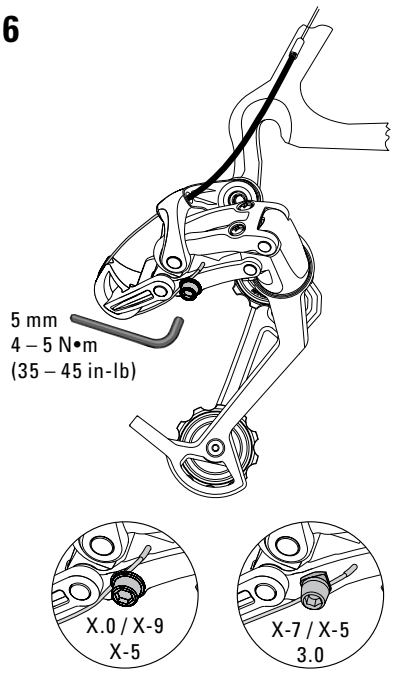

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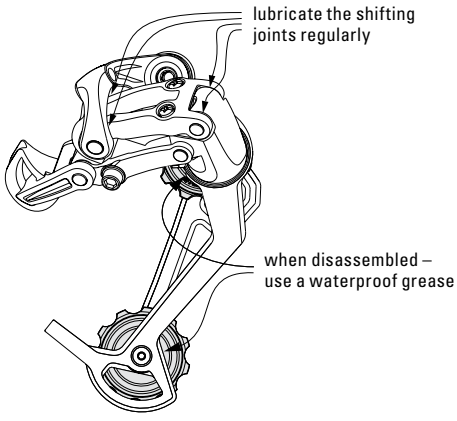


• While pedaling, move the shifter up one detent.

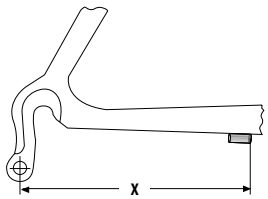
– If the chain hesitates or does not shift to the second cog, increase the cable tension by turning the shifter barrel adjuster counterclockwise.

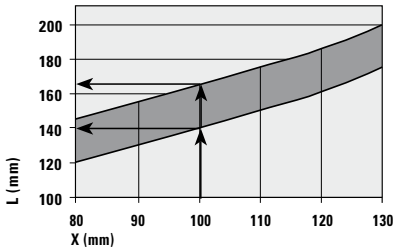
– If the chain shifts beyond the second cog, decrease the cable tension by turning the shifter barrel adjuster clockwise.

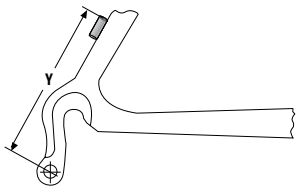
• Repeat the two former steps until shifting and cable tension is accurate.

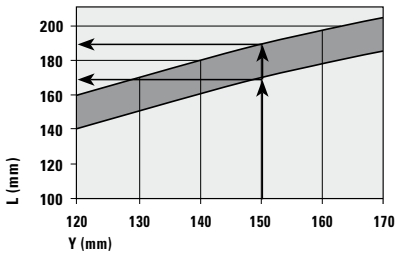
• While turning the crank, shift the chain up and down the cassette and chain rings several times to ensure that your derailleur is indexing smoothly.

Chart / length of cable housings









Example:
Distance Y = 150 mm → cable housing length L = 165 – 190 mm.

Caution:
It is imperative to respect the values for the correct length of cable housing.

TROUBLESHOOTING		
Problem	Cause	Remedy
Chain jumps from smallest sprocket to frame dropout.	High gear limit screw is not adjusted properly.	Turn in screw H until the guide pulley is aligned with the smallest sprocket.
Difficult or impossible to shift chain onto smallest sprocket.	High gear limit screw is not adjusted properly.	Unscrew screw H until the guide pulley is aligned with the smallest sprocket.
Chain jumps over largest sprocket and falls between the spokes and largest sprocket or inner cage plate scrapes on spokes.	Low gear limit screw is not adjusted properly.	Turn in screw L until the guide pulley is aligned with the largest sprocket.
	Rear derailleur or derailleur hanger is bent.	Straighten or replace.
Delayed shifting.	Clearance between guide pulley / sprocket is too large.	Adjust b-adjust screw by rotating counterclockwise.
Rough shifting behavior.	Clearance between guide pulley / sprocket is too small.	Adjust b-adjust screw by rotating clockwise.
Shifts more gears onto smaller sprockets than intented.	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto larger sprocket.	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto smaller sprocket.	Shift cable is too tight.	Turn barrel adjuster on the shifter clockwise.
	Excessive cable friction, pinched or poorly routed cable.	Lubricate or replace cable and housing. Check for excessive bending of cable housing.

X.0 · REAR DERAILLEURS MAINTENANCE

1

2

3

PULLEY MAINTENANCE

ADVICE
X.0 pulleys use stainless steel balls and races for exceptional durability and corrosion resistance. When riding in wet, muddy, sandy or dusty conditions, periodic maintenance will insure a very long service life.

• Remove the pulleywheel screws (1, **Figure 1**) using a 3 mm allen key. Make sure to fully engage the key in the 3 mm hex hole.

• Remove the aluminum covers (2) from both sides of the pulleywheels.

• Clean all parts carefully and give the bearings a spin to make sure they run smoothly. If not, use a sharp pick to carefully remove the black rubber seal from one side of the bearing (**Figure 2**), clean the bearing thoroughly and repack with a quality waterproof grease, then replace the rubber seal by pressing it into place.

• When assembling the covers to the pulleywheel, fill the gap between bearing and covers with a quality waterproof grease.

• Tightening torque of the pulleywheel screws is 2.5 N•m.

• If pulleys or bearings are damaged, replace with new SRAM X.0 pulleys, which come with new bearings and aluminum covers.

CAGE PIVOT MAINTENANCE / CAGE SPRING TENSION ADJUSTMENT

CAUTION
Wear safety glasses while disassembling and reassembling the derailleur cage spring.

• Hold the cage in an extended position so you can reach the cage stop screw on the outside of the cage (**Figure 3**).

ADVICE
Disassembly and assembly of the cage stop screw are easier if you have assistance.

• Use a 2.5 mm wrench to remove the cage stop screw (**Figure 3**).

• Now carefully and slowly let the cage unwind to relieve spring tension.

• Remove the cage and spring. The cage must be rotated to the position shown in **Figure 4** to remove it from the derailleur body.

• Clean thoroughly the shaft, cage plate, derailleur body and spring.

• Re-grease the shaft, spring tab and spring supports with a quality water-proof grease.

• Reinstall the spring and cage (**Figure 5**). There are several cavities in the derailleur body, but only one is designed for installing the spring tab. Be certain to use the correct cavity.

ADVICE
X.0 cage plates have 2 mounting holes (**Figure 6**). The lowest spring tension position offers ideal tension for all around XC riding.
Higher spring tension holes are only recommended after extensive use has reduced the spring's stiffness.

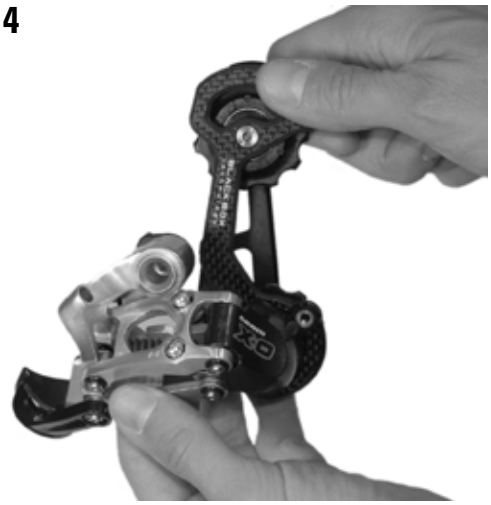
• Wind the cage counterclockwise to tension the spring. The cage can not be fully installed into the derailleur body until the cage is at the same position as when it was originally removed (**Figure 4**).

• After the cage is fully installed in the derailleur body, continue to rotate the cage counterclockwise until you can access the cage stop screw hole.

• A helping hand holding the cage makes the installation of the 2.5 mm stop screw easier (**Figure 3**). Tightening torque of the cage stop is 1.5 N•m (13 in-lb).

X.0 · REAR DERAILLEURS MAINTENANCE

4



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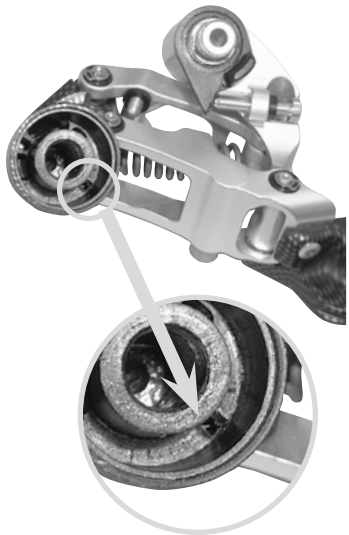

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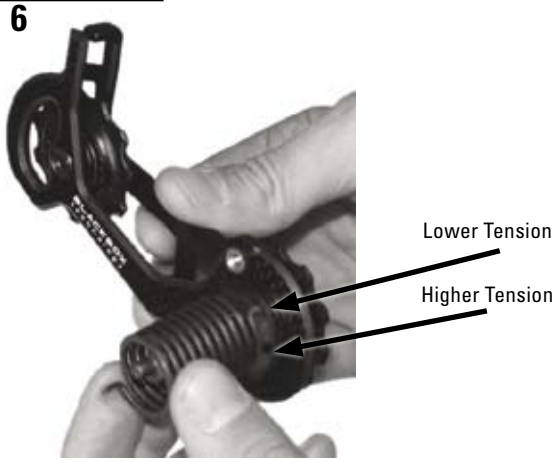

TROUBLESHOOTING

Problem	Cause	Remedy
Chain jumps from smallest sprocket to frame dropout.	High gear limit screw is not adjusted properly.	Turn in screw H until the guide pulley is aligned with the smallest sprocket.
Difficult or impossible to shift chain onto smallest sprocket.	High gear limit screw is not adjusted properly.	Unscrew screw H until the guide pulley is aligned with the smallest sprocket.
Chain jumps over largest sprocket and falls between the spokes and largest sprocket or inner cage plate scrapes on spokes.	Low gear limit screw is not adjusted properly.	Turn in screw L until the guide pulley is aligned with the largest sprocket.
	Rear derailleur or derailleur hanger is bent.	Straighten or replace.
Delayed shifting.	Clearance between guide pulley / sprocket is too large.	Adjust b-adjust screw by rotating counterclockwise.
Rough shifting behavior.	Clearance between guide pulley / sprocket is too small.	Adjust b-adjust screw by rotating clockwise.
Shifts more gears onto smaller sprockets than intented.	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto larger sprocket.	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto smaller sprocket.	Shift cable is too tight.	Turn barrel adjuster on the shifter clockwise.
	Excessive cable friction, pinched or poorly routed cable.	Lubricate or replace cable and housing. Check for excessive bending of cable housing.

SRAM ESP · REAR DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	SRAM ESP
Speeds	8 / 7
Shifter Compatibility	SRAM 1:1 Actuation Ratio 8 / 7 speed shifters
Cogsets and Chains	SRAM / Shimano HG 8 / 7spd
Chainrings	22-32-42/44, 24-34-46, 26-36-46/48
Total	45 T
Cage Length	Long
Max Sprocket	34 T
Min Sprocket	11 T
Front Difference	22 T
Spring Enhancement	Yes
Pulleys	Bushing
Direct Mount	Yes
Cable and Housing	1.1 or 1.2 mm high quality cables, 4 or 5 mm compressionless cable housing with end cap / maximum diameter of 5.8 mm
Knuckles	Grilon Composite
Outer Link	Grilon Composite
Inner Link	Steel / Zinc Coat
Outer Cage	Grilon Composite
Inner Cage	Grilon Composite
Hanger Bolt	Steel

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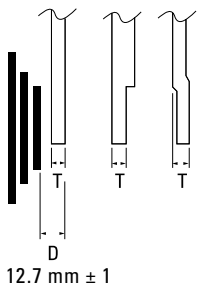

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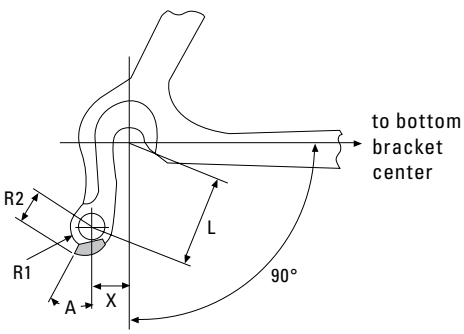
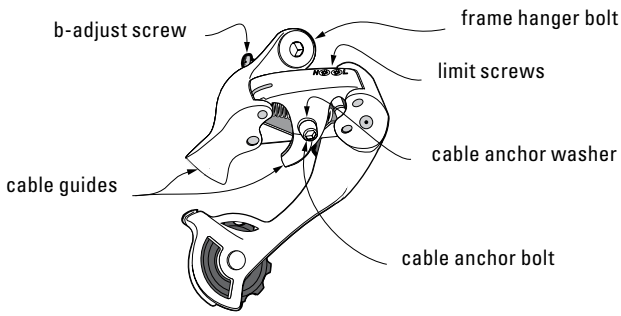


DERAILLEUR ANATOMY



FRAME DIMENSIONS

(see **Figure 1** and **2**)

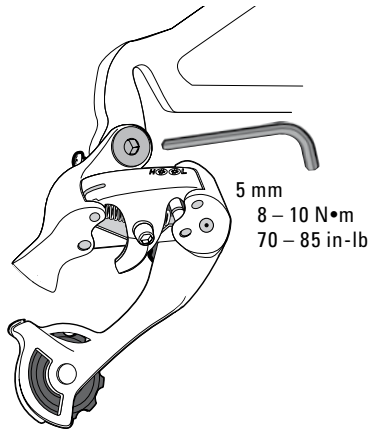
• For optimal 1:1 Actuation Ratio rear derailleur performance, the recommended rear derailleur hanger length (L) should be 28 – 30 mm.

• For a given L, use the chart below to determine other 1:1 Actuation Ratio rear derailleur hanger specifications.

L	X	A	R1	R2	T
28	6 - 10	25˚ – 30˚	8.5 max	11.5 – 13.5	7 – 8
30	7.5 – 10	25˚ – 30˚	8.5 max	11.5 – 13.5	7 – 8

SRAM ESP · REAR DERAILLEURS
ASSEMBLY / MAINTENANCE

1



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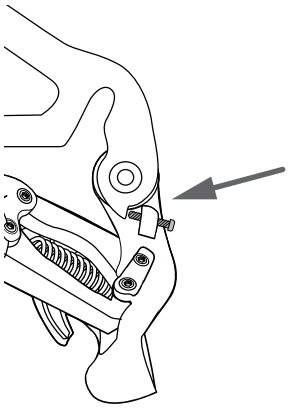

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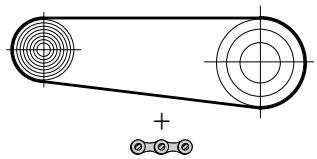

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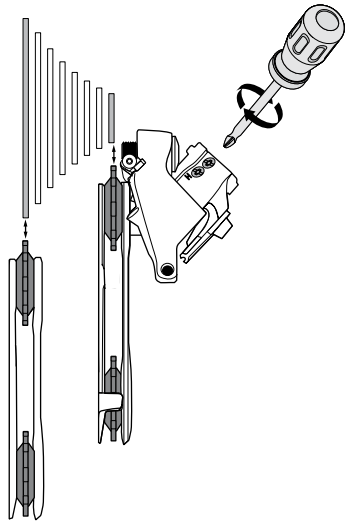

ASSEMBLY

ADVICE
Check the rear derailleur hanger alignment. A bent rear derailleur hanger will result in inaccurate index shifting. Outboard side impacts are the most common causes of this type of damage.

• Attach the rear derailleur to the frame's rear derailleur hanger using a 5 mm hex wrench **(Figure 1)**.

• Check that the b-adjust screw is clear of the rear derailleur dropout tab **(Figure 2)**.

• Tighten the 5 mm hex hanger bolt to 8 – 10 N•m (70–85 in-lb) **(Figure 1)**.

CHAIN LENGTH

A properly measured chain will prevent damage in case of accidentally shifting to the largest chain ring and cog combination. This type of accidental shifting may cause harmful binding or seizure of the chain and potentially cause severe damage.

• Bypassing the rear derailleur, run the chain around the largest cog/large chainring combination **(Figure 3)**.
– For rear suspension frames, position the rear suspension for the greatest chain length required.

• Add 2 LINKS or 1 link + Connecting Link to this length for proper chain length.

LIMIT SCREWS ADJUSTMENT

• View the rear derailleur and pulleys from behind the rear of the bicycle **(Figure 4)**.

• Using a small screwdriver, turn the limit screw marked 'H' on the outer link of the derailleur to align the upper guide pulley center with the outboard edge of the smallest cog – clockwise moves the guide pulley inboard towards the wheel.

• While turning the crank, push the rear derailleur towards the larger cogs by hand.

• Align the upper guide pulley under the largest cog, center to center, by turning the limit screw marked 'L' on the outer link – clockwise moves the guide pulley outboard away from the spokes.

CHAIN GAP ADJUSTMENT

Chain gap is the distance between the upper guide pulley and the cog the chain is riding on. Optimal chain gap is small enough to allow quick, efficient shifts to and from any cog, but large enough to allow smooth shifts to and from the largest cog.

• Shift chain to the small chain ring.

• While turning the crank, push the rear derailleur inboard by hand to the largest cog.

• Hold the derailleur in this position while making the following adjustment:

• Use a 3 mm hex wrench, turn the b-adjust screw until the chain gap equals approximately 6 mm ($^1/_4$") from tip of the cog to tip of upper guide pulley **(Figure 5)**.
– Turn the b-adjust screw clockwise to increase the chain gap.
– Turn the b-adjust screw counterclockwise to decrease the chain gap.

ADVICE
Bicycles equipped with an 11–28 or 14–28 cassette may require you to set the chain gap at the smallest cog. This is due to the shallow angle of the cassette in relation to the steeper movement of the rear derailleur.

Precision index shifting may require small changes of the b-adjustment while setting the proper cable tension.

Do not use the b-adjust screw to adjust the rear derailleur to act as a chain-tensioning device or to prevent chain suck. This increases the chain gap causing poor shifting performance.

INDEX SHIFTING ADJUSTMENT

• Check that the chain and the rear derailleur are in the smallest cog position.

• Measure and cut the rear piece of cable housing. Make sure that it is not too short or long.

• Rotate the rear shifter until the largest number and gear indication tab/dash line up.

• Turn the rear shifter barrel adjust clockwise fully into the shifter, then turn counterclockwise 1 full turn.

• Feed the rear shifter cable through the rear derailleur cable housing, stops and cable guides.

• Thread the rear derailleur cable through the rear derailleur-housing stop and through the cable guide on the fin **(Figure 6)**.

• Pull the cable tight and position it under the cable anchor washer **(Figure 6)**.

• Tighten the 5 mm hex cable anchor bolt to 4 – 5 N•m (35 – 45 in-lb)
– Be careful not to crush or deform the cable.

• Rapidly shift the chain and derailleur up and down the cassette several times. If the cable slips repeat the two former steps.

• Shift the chain to the smallest cog.

• While pedaling, move the shifter up one detent.
– If the chain hesitates or does not shift to the second cog, increase the cable tension by turning the shifter barrel adjuster counterclockwise.
– If the chain shifts beyond the second cog,

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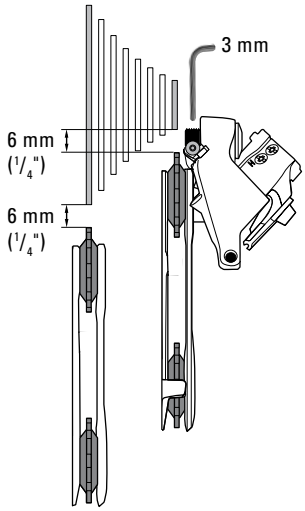

decrease the cable tension by turning the shifter barrel adjuster clockwise.

- Repeat the two former steps until shifting and cable tension is accurate.
- While turning the crank, shift the chain up and down the cassette and chain rings several times to ensure that your derailleur is indexing smoothly.

MAINTENANCE

- Do not use solvents or corrosive materials to clean the components.
- Lubricate the shifting joints regularly **(Figure 7)**.
- Grease any cable guides (e.g. beneath the bottom bracket).

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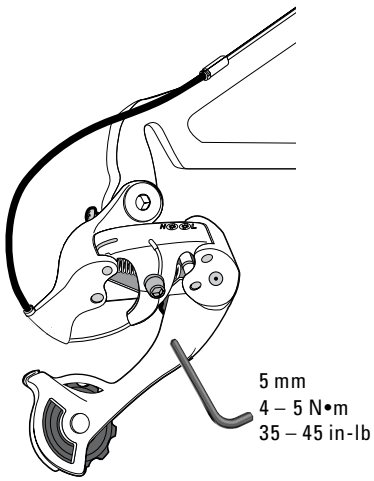

TROUBLESHOOTING

Problem	Cause	Remedy
Chain jumps from smallest sprocket to frame dropout.	High gear limit screw is not adjusted properly.	Turn in screw H until the guide pulley is aligned with the smallest sprocket.
Difficult or impossible to shift chain onto smallest sprocket.	High gear limit screw is not adjusted properly.	Unscrew screw H until the guide pulley is aligned with the smallest sprocket.
Chain jumps over largest sprocket and falls between the spokes and largest sprocket or inner cage plate scrapes on spokes.	Low gear limit screw is not adjusted properly.	Turn in screw L until the guide pulley is aligned with the largest sprocket.
	Rear derailleur or derailleur hanger is bent.	Straighten or replace.
Delayed shifting.	Clearance between guide pulley / sprocket is too large.	Adjust b-adjust screw by rotating counterclockwise.
Rough shifting behavior.	Clearance between guide pulley / sprocket is too small.	Adjust b-adjust screw by rotating clockwise.
Shifts more gears onto smaller sprockets as intented	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto larger sprocket	Shift cable insufficiently tensioned.	Turn barrel adjuster on the shifter counterclockwise.
Delayed shifting onto smaller sprocket	Shift cable is too tight.	Turn barrel adjuster on the shifter clockwise.
	Excessive cable friction, pinched or poorly routed cable	Lubricate or replace cable and housing. Check for excessive bending of cable housing.

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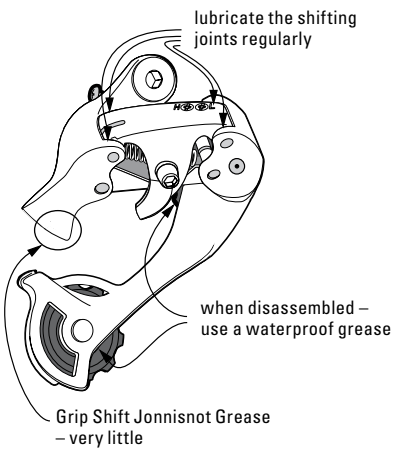

X-9 / X-7 / 3.0 · HIGH CLAMP FRONT DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	X-9 High Clamp		X-7 High Clamp	3.0
28.6 mm	—		with band adaptor	with band adaptor
31.8 mm	original		with band adaptor	with band adaptor
34.9 mm	original		original	original
Rear Compatibility	9 speed		9 speed	8 speed / 7 speed
Index Compatible	Yes		Yes	Yes
Total Capacity	22 T		22 T	20 T
Top-Middle Min. Capacity	Minimum 12 T		Minimum 12 T	Minimum 10 T
Top Gear Teeth	44 T or 48 T		44 T or 48 T	42 T or 48 T
Cable Routing	Top Pull Type	Bottom Pull Type	Twin Pull Type (Top and Bottom Pull)	
Chainstay Angle	66 – 69°		66 – 69°	66 – 69°
Mount Type	High Clamp		High Clamp	High Clamp
Chain Line	47.5 – 51 mm		47.5 – 51 mm	47.5 – 51 mm
Band Material	Aluminum, forged		Aluminum	Steel
Outer Link	Aluminum		Aluminum	Steel
Inner Link	Aluminum		Aluminum	Steel
Link Bushing	Outer Sealed		Outer Sealed	Bushing
Chain Cage	Steel Chrome Plated		Steel Chrome Plated	Steel Chrome Plated
Color	Silver, polished		Silver or black painted	Black

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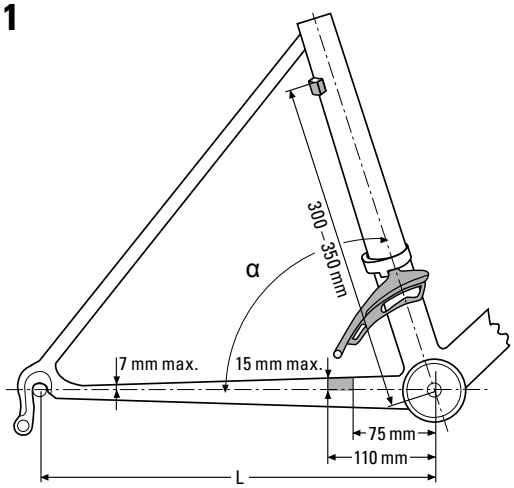

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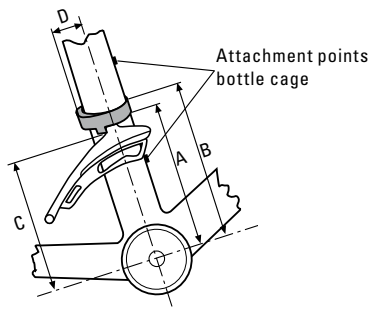

FRAME DIMENSIONS

(see **Figure 1**)

- For Top Pull version: upper cable stop should be positioned 300 – 350 mm above bottom bracket center.
- The seat tube should be positioned in the center of the bottom bracket shell.

Length of chainstay:

- MTB/Trekking L > 420 mm.
- Rear frame alignment must be symmetrical.

Chainstay angle:
α = 66° – 69°.

Chainline:

47.5 – 51 mm.
(Measurement from the center of the bracket to the center of middle chainring).

NECESSARY CLEARANCE

(see **Figure 2**)
Be sure to leave enough clearance between bottle cage holes and clamp location.

NECESSARY CLEARANCE
see **Figure 2**

		X-9 High Clamp 44T	X-9 High Clamp 48T	X-7 High Clamp 44T
Clamp position	A	130 mm	135 mm	130 mm
	B	152 mm	157 mm	152 mm
	C	100 mm	105 mm	100 mm
Tire clearance	D	22 mm (Top Pull) / 36 mm (Bottom Pull)		38 mm

		X-7 High Clamp 48T	3.0 42T	3.0 48T
Clamp position	A	135mm	114 mm	119 mm
	B	157 mm	128 mm	133 mm
	C	105 mm	107 mm	112 mm
Tire clearance	D	38 mm	43 mm	43 mm

X-9 / X-7 / 3.0 · HIGH CLAMP FRONT DERAILLEURS
ASSEMBLY / MAINTENANCE

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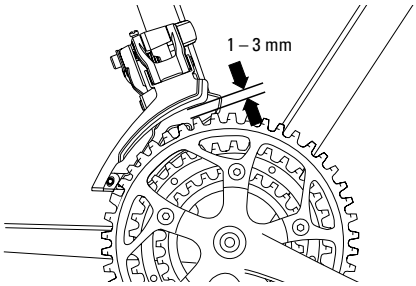

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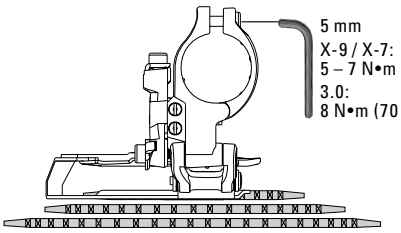

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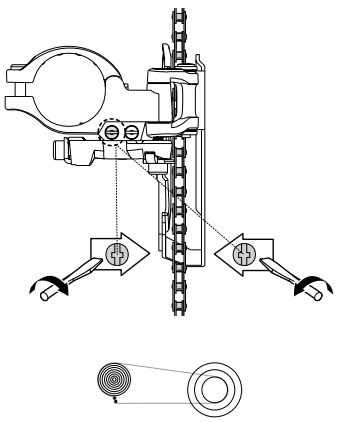

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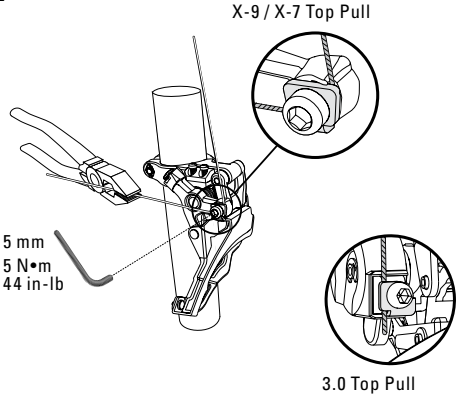

ASSEMBLY

• Attach the front derailleur to the seat tube.

• Adjust the position along the seat tube so that clearance between the front derailleur cage and the large chainring is 1 – 3 mm (**Figure 1**).

At the same time, align the front derailleur cage outerplate to be para llel with the chainrings **(Figure 2)**.

• Tighten the 5 mm hex clamp bolt to 5 – 7 N•m (44 – 62 in-lb) for X-9 / X-7 or 8 N•m (70 in-lb) for 3.0.

LOW LIMIT ADJUSTMENT

(see **Figure 3**)

• Place the chain on the largest rear cog and the smallest front chainring.

• Adjust the low limit screw **(Figure 3)** so that the chain is positioned close to the inner cage plate without actually touching it.

CONNECTING CABLE

• Check that the chain and the front derailleur are in the smallest chainring position.

• Place the front shifter in gear position '1'.

• Turn the front shifter barrel adjuster clockwise fully into the shifter, then turn counterclockwise 1 full turn.

• Feed the front shifter cable through the cable housing and stops.

• Run the cable under the cable anchor washer and hold taut.

– Top pull **(Figure 4)**.

– Bottom pull **(Figure 5)**.

• Tighten the 5 mm hex cable anchor bolt to 5 N•m (44 in-lb).

• Shift the chain up and down the chainrings several times to take out initial slack in the cable.

• If necessary re-tension the cable and tighten cable anchor bolt.

HIGH LIMIT ADJUSTMENT

(see **Figure 6**)

• Set the chain to the smallest rear cog and the largest front chainring.

• Adjust the high limit screw so that clearance between the front derailleur cage outer plate and the chain is 0 – 0.5 mm.

INDEX SHIFTING ADJUSTMENT

(see **Figure 7**)

Shift the chain onto the largest rear sprocket and middle chainring – if the chain scrapes against the inner cage plate, turn the adjusting barrel on the shifter clockwise until the chain shifts smoothly and free of obstruction.

X-9 / X-7 / 3.0 · HIGH CLAMP FRONT DERAILLEURS
ASSEMBLY / MAINTENANCE

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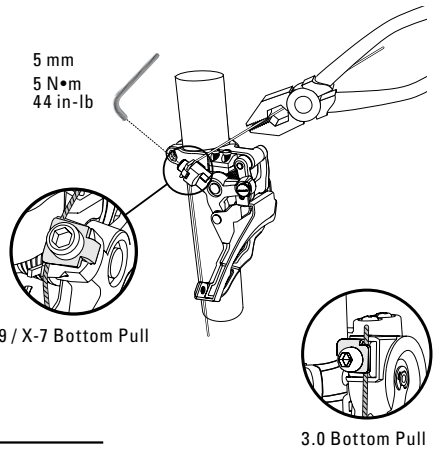

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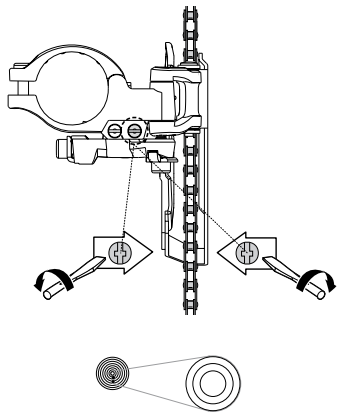

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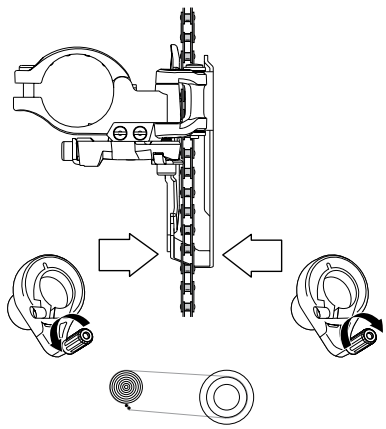

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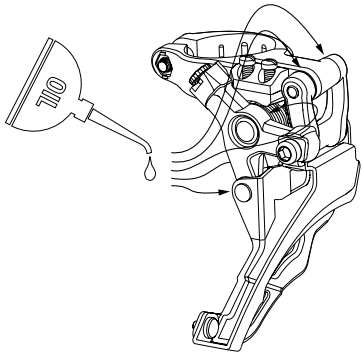
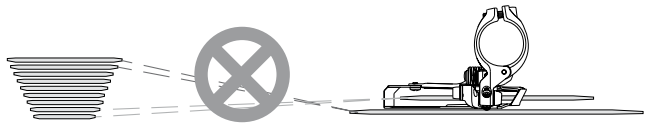


ADVICE
Avoid using extreme gear combinations as these combinations cause noise and excessive wear!



MAINTENANCE

- Do not use solvents or corrosive materials to clean the components.
- Lubricate the shifting joints regularly **(Figure 8)**.
- Grease any cable guides (e.g. beneath the bottom bracket).

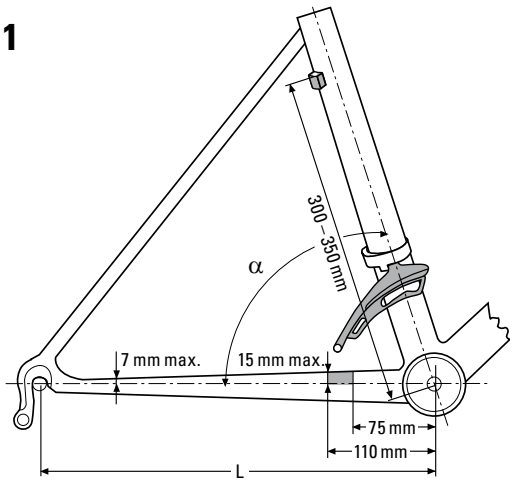
TROUBLESHOOTING

Problem	Cause	Remedy
Shifter actuated, chain fails to change chainring.	Shift cable incorrectly clamped.	Check shift cable and correct as necessary (cable clamp; cable housing stops; cable recess in shifter; cable tension).
	High / low limit screw poorly adjusted.	Correct limit screws
	Clearance between cage and large chainring is too big / small.	Correct position (1 - 3mm).
Chain falls over large / small chainring.	High / low limit screw poorly adjusted.	Lubricate or replace cable and housing. Check for excessive bending of cable housing.
Force required to actuate gears is too high.	Excessive cable friction, pinched or poorly routed cable.	Correct high limit screw.
Crank collides with front derailleur.		Correct the front derailleur position.

X-9 / X-7 / X-5 · LOW CLAMP FRONT DERAILLEURS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	X-9 Low Clamp		X-7 Low Clamp	3.0
28.6 mm	—		—	—
31.8 mm	original		with band adaptor	with band adaptor
34.9 mm	original		original	original
Rear Compatibility	9 speed		9 speed	9 speed
Index Compatible	Yes		Yes	Yes
Total Capacity	22 T		22 T	22 T
Top-Middle Min. Capacity	Minimum 12 T		Minimum 12 T	Minimum 12T
Top Gear Teeth	44 T or 48 T		44 T or 48 T	44 T or 48 T
Cable Routing	Top Pull Type	Bottom Pull Type	Twin Pull Type (Top and Bottom Pull)	
Chainstay Angle	66 – 69°		66 – 69°	66 – 69°
Mount Type	Low Clamp		Low Clamp	Low Clamp
Chain Line	51 mm		47.5 – 51 mm	47.5 – 51 mm
Band Material	Aluminum, forged		Aluminum	Aluminum
Outer Link	Steel		Steel	Steel
Inner Link	Aluminum, forged		Aluminum	Aluminum
Link Bushing	Outer Sealed		Outer Sealed	Outer Sealed
Chain Cage	Steel Chrome Plated		Steel Chrome Plated	Steel Chrome Plated
Color	Polished and clear coated		Silver or black painted	Silver or black painted

1



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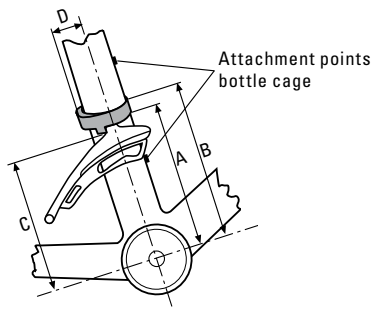


FRAME DIMENSIONS

(see **Figure 1**)

• For Top Pull version: upper cable stop should be positioned 300 – 350 mm above bottom bracket center.

• The seat tube should be positioned in the center of the bottom bracket shell.

Length of chainsty:

• MTB/Trekking L > 420 mm.

• Rear frame alignment must be symmetrical.

Chainstay angle:
α = 66° – 69°.

Chainline:
X-9: 51 mm / X-7 and X-5: 47.5 – 51 mm
(Measurement from the center of the bracket to the center of middle chainring).

NECESSARY CLEARANCE

(see **Figure 2**)
Be sure to leave enough clearance between bottle cage holes and clamp location.

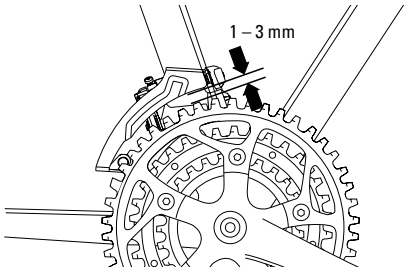
NECESSARY CLEARANCE
see **Figure 2**

		X-9 Low Clamp 44T	X-9 Low Clamp 48T	X-7 Low Clamp 44T
Clamp position	A	69 mm	74 mm	69 mm
	B	86 mm	91 mm	86 mm
	C	71 mm	76 mm	69 mm
Tire clearance	D	42 mm	42 mm	43 mm

		X-7 Low Clamp 48T	X-5 Low Clamp 44T	X-5 Low Clamp 48T
Clamp position	A	74mm	69 mm	74 mm
	B	91 mm	86 mm	91 mm
	C	74 mm	69 mm	74 mm
Tire clearance	D	43 mm	43 mm	43 mm

X-9 / X-7 / X-5 · LOW CLAMP FRONT DERAILLEURS ASSEMBLY

1



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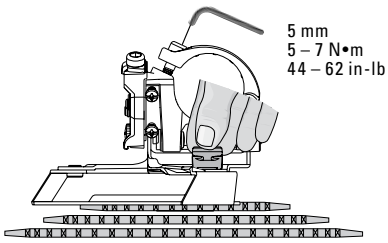

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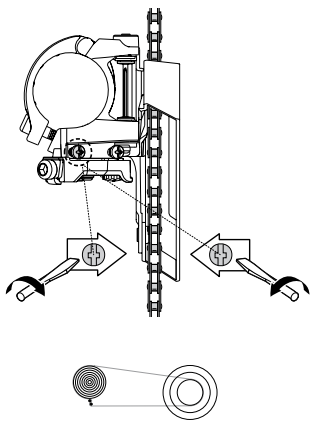

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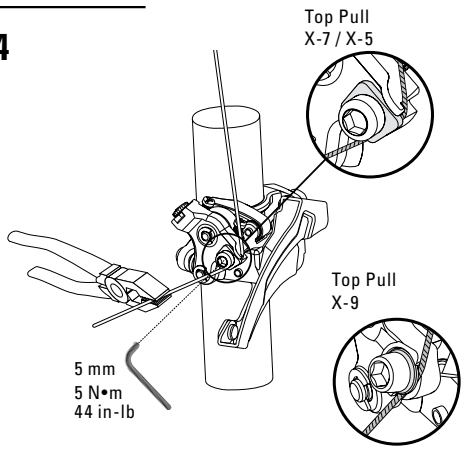


ASSEMBLY

• Attach the front derailleur to the seat tube.

• Adjust the position along the seat tube so that clearance between the front derailleur cage and the large chainring is 1 – 3 mm (**Figure 1**).

At the same time, align the front derailleur cage outerplate to be para llel with the chainrings **(Figure 2)**.

• Tighten the 5 mm hex clamp bolt to 5 – 7 N•m (44 – 62 in-lb).

• Remove the mounting aid (piece of plastic – **Figure 2**).

LOW LIMIT ADJUSTMENT

(see **Figure 3**)

• Place the chain on the largest rear cog and the smallest front chainring.

• Adjust the low limit screw **(Figure 3)** so that the chain is positioned close to the inner cage plate without actually touching it.

CONNECTING CABLE

• Check that the chain and the front derailleur are in the smallest chainring position.

• Place the front shifter in gear position '1'.

• Turn the front shifter barrel adjuster clockwise fully into the shifter, then turn counterclockwise 1 full turn.

• Feed the front shifter cable through the cable housing and stops.

• Run the cable under the cable anchor washer and hold taut.

– Top pull **(Figure 4)**.

– Bottom pull **(Figure 5)**.

• Tighten the 5 mm hex cable anchor bolt to 5 N•m (44 in-lb).

• Shift the chain up and down the chainrings several times to take out initial slack in the cable.

• If necessary re-tension the cable and tighten cable anchor bolt.

HIGH LIMIT ADJUSTMENT

(see **Figure 6**)

• Set the chain to the smallest rear cog and the largest front chainring.

• Adjust the high limit screw so that clearance between the front derailleur cage outer plate and the chain is 0 – 0.5 mm.

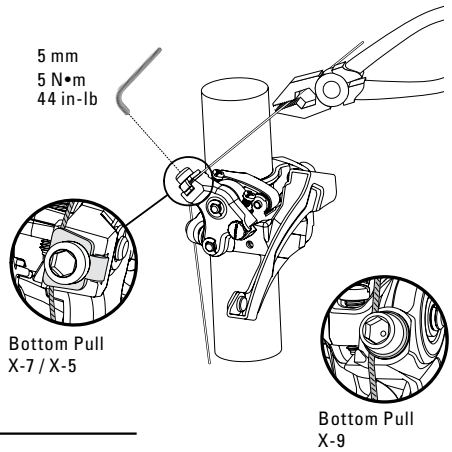
INDEX SHIFTING ADJUSTMENT

(see **Figure 7**)

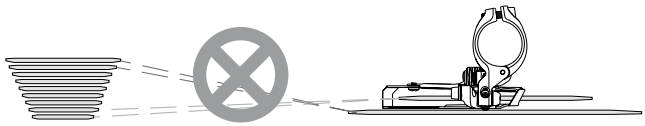
Shift the chain onto the largest rear sprocket and middle chainring – if the chain scrapes against the inner cage plate, turn the adjusting barrel on the shifter clockwise until the chain shifts smoothly and free of obstruction.

X-9 / X-7 / X-5 · LOW CLAMP FRONT DERAILLEURS
ASSEMBLY

5



ADVICE
Avoid using extreme gear combinations as these combinations cause noise and excessive wear!



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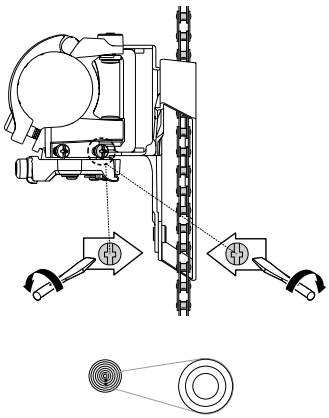

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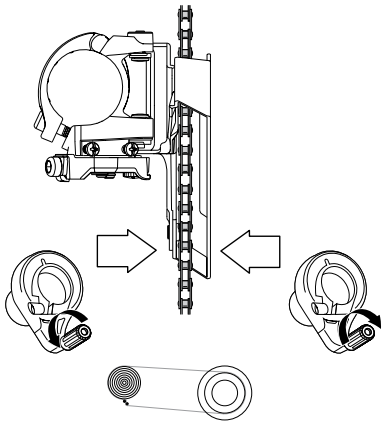

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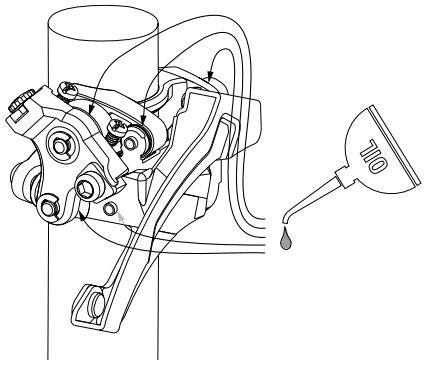


TROUBLESHOOTING

Problem	Cause	Remedy
Shifter actuated, chain fails to change chainring.	Shift cable incorrectly clamped.	Check shift cable and correct as necessary (cable clamp; cable housing stops; cable recess in shifter; cable tension).
	High / low limit screw poorly adjusted.	Correct limit screws
	Clearance between cage and large chainring is too big / small.	Correct position (1 - 3mm).
Chain falls over large / small chainring.	High / low limit screw poorly adjusted.	Lubricate or replace cable and housing. Check for excessive bending of cable housing.
Force required to actuate gears is too high.	Excessive cable friction, pinched or poorly routed cable.	Correct high limit screw.
Crank collides with front derailleur.		Correct the front derailleur position.

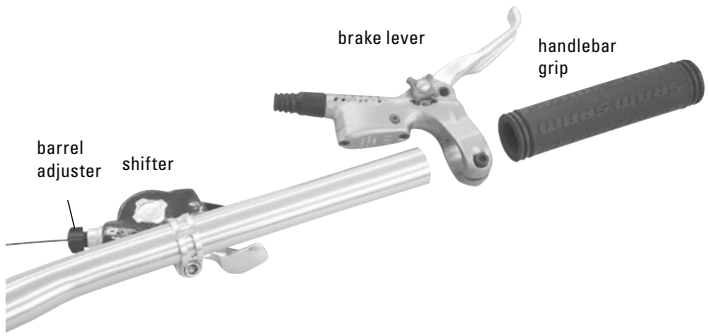
X.0 / X-9 · TRIGGER SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	X.0		X-9	
Shifter Type	Front / Index	Rear 1:1 Actuation Ratio	Front / Index	Rear 1:1 Actuation Ratio
Speeds	3	9	3	9
Derailleur	SRAM & Shimano	SRAM 1:1 Actuation Ratio	SRAM & Shimano	SRAM 1:1 Actuation Ratio
Crankset	Triple Indexed		Triple Indexed	
Cable Pull Release	Zero Loss Technology		Zero Loss Technology	
Cable	PTFE Coated Stainless Steel		PTFE Coated Stainless Steel	
Gear Indication	None			
Barrel Adjuster	Indexing, Composite		Indexing, Composite	
Clamping Diameter	22.1 – 22.3 mm		22.1 – 22.3 mm	

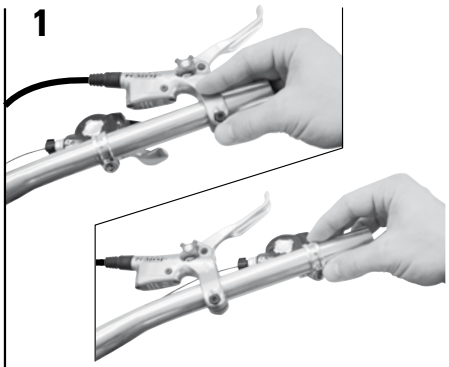
CABLE HOUSING

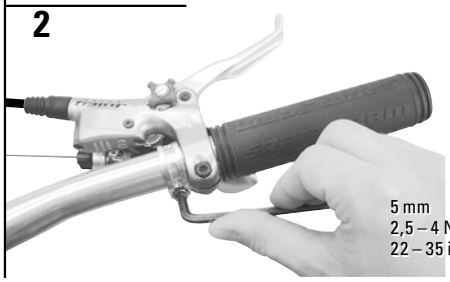
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY



X.0 / X-9 · TRIGGER SHIFTERS
ASSEMBLY





ASSEMBLY

- Slide shifter and brake lever onto handlebar. Either component can be mounted first, depending on personal preference **(Figure 1)**.
- Slide the handlebar grip onto the handlebar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

- Choose the best position for your ergonomic needs. Tighten the 5 mm hex clamp bolt to 2.5 – 4 N•m (22 – 35 in-lb) **(Figure 2)**.
- Feed the cable through the cable housing and stops. Make sure the shifter is in fully released position (lowest gear position (front shifter) or the highest gear number (rear shifter)).
- Attach the front/rear shifter cable to the front/rear derailleur.
- Adjust indexing per derailleur instructions.

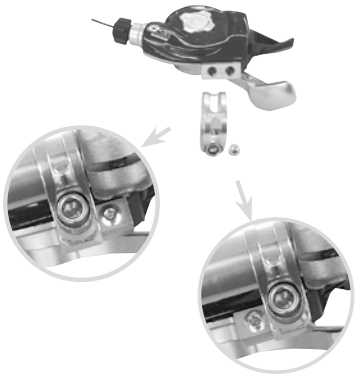
CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between a shifter and a brake lever, rotate one out of the way.

Check for proper brake lever operation again!

X.0 / X-9 · TRIGGER SHIFTERS
USE / MAINTENANCE

3



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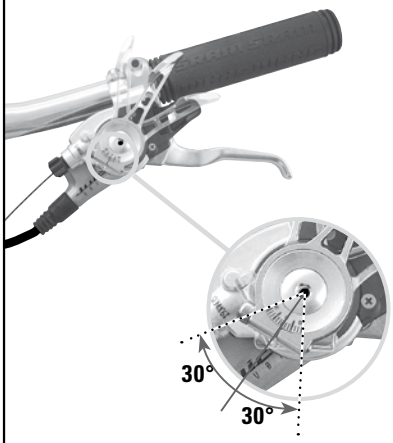

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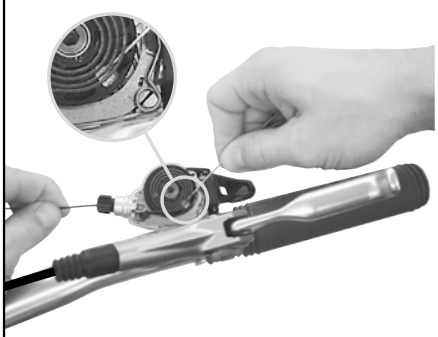


USE

CAUTION

Always check the front and rear brake levers for proper operation.

If there is interference between a shifter and a brake lever, rotate one out of the way.

Check for proper brake lever operation again!

The shifter offers the following adjustments:

– Shifter can be installed on handlebar inside and outside of brake **(Figure 1)**.

– Clamp can be installed in two positions on shifter housing **(Figure 3)**.
Tighten the 5 mm hex clamp bolt to 2.5 – 4 N•m (22 – 35 in-lb).

X.0 only: Aluminum lever orientation is infinitely adjustable **(Figure 4)**.

CABLE CHANGE

ADVICE

Use only new high quality cable and compressionless cable housing with endcaps.

• Make sure the shifter is in fully released position (lowest gear position (front shifter) or the highest gear number (rear shifter)).

• Detach the cable from the derailleur.

• Cut the cable off 6" (15 cm) from the shifter barrel adjuster. Discard the old cable and cable housing.

• Remove cover by unscrewing the top cap by hand **(Figure 5)**.

• Remove cable. It may be helpful to use a pick **(Figure 6)**.

• Feed the new cable through the cable entry and out of the barrel adjuster.

• Replace cover.

• Feed the cable through the new cable housing and cable stops.

• Attach the cable to the derailleur and adjust indexing per derailleur instructions.

MAINTENANCE

Clean the shifter using only water and mild soap.

X-7 / X-5 / X-4 / ATTACK · TRIGGER SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

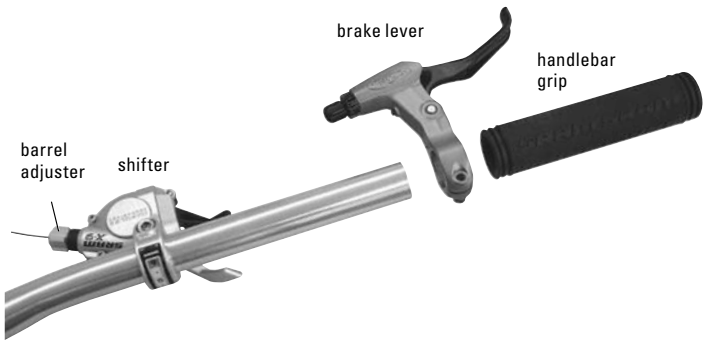
	X-7		X-5	
Shifter Type	Front / Index	Rear 1:1 Actuation Ratio	Front / Index	Rear 1:1 Actuation Ratio
Speeds	3	9	3	9
Derailleur	SRAM & Shimano	SRAM 1:1 Actuation Ratio	SRAM & Shimano	SRAM 1:1 Actuation Ratio
Crankset	Triple Indexed		Triple Indexed	
Cable Pull Release	Impulse Technology		Impulse Technology	
Cable	Stainless Steel	Stainless Steel	Stainless Steel	
Gear Indication	Window			
Barrel Adjuster	Indexing, Aluminum		Indexing	
Clamping Diameter	22.1 – 22.3 mm		22.1 – 22.3 mm	

	X-4		Attack	
Shifter Type	Front / Index	Rear 1:1 Actuation Ratio	Front / Index	Rear 2:1 Actuation Ratio
Speeds	3	8	3	9
Derailleur	SRAM & Shimano	SRAM 1:1 Actuation Ratio	SRAM & Shimano	Shimano
Crankset	Triple Indexed		Triple Indexed	
Cable Pull Release	Impulse Technology		Impulse Technology	
Cable	Standard		Stainless Steel	
Gear Indication	Window		Window	
Barrel Adjuster	Indexing		Indexing	
Clamping Diameter	22.1 – 22.3 mm		22.1 – 22.3 mm	

CABLE HOUSING

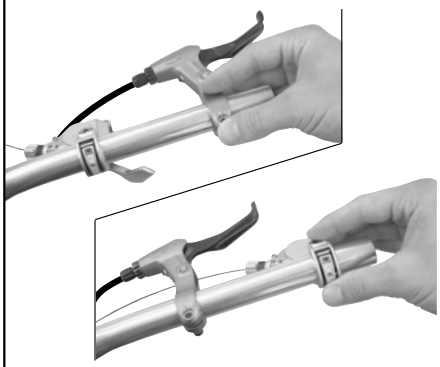
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY



X-7 / X-5 / X-4 / ATTACK · TRIGGER SHIFTERS
ASSEMBLY

1



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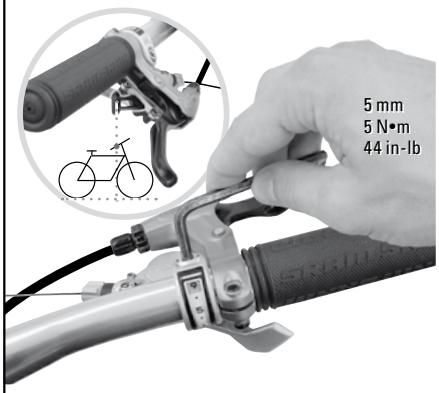


ASSEMBLY

• Slide shifter and brake lever onto handlebar. Either component can be mounted first **(Figure 1)**.

• Slide the handlebar grip onto the handlebar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Position the shifter as you wish. We recommend that the surface of the smaller shift lever is vertical. Tighten the 5 mm hex clamp bolt to 5 N•m (44 in-lb) **(Figure 2)**.

• Feed the cable through the cable housing and stops. Make sure the shifter is in gear position "1" (front shifter) or the HIGHEST gear number (rear shifter).

• Attach the shifter cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check for proper brake lever operation.

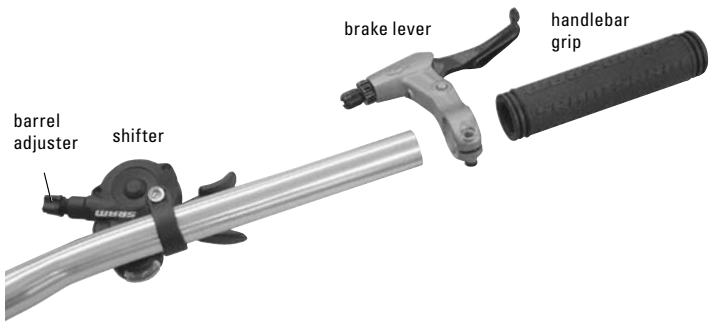
TRX · TRIGGER SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	TRX		
Shifter Type	Front / Index	Rear 2:1	Rear 2:1
Speeds	3	8	7
Derailleur	SRAM & Shimano	Shimano	Shimano
Crankset	Triple Indexed		
Cable Pull Release	Uni-Lever Technology		
Cable	Standard		
Gear Indication	Window		
Barrel Adjuster	Indexing		
Clamping Diameter	22.1 – 22.3 mm		
Shifter Length	N/A		

CABLE HOUSING

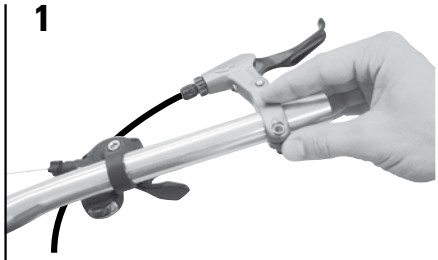
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY



TRX · TRIGGER SHIFTERS
ASSEMBLY / MAINTENANCE

1



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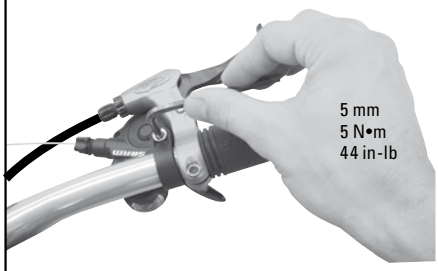

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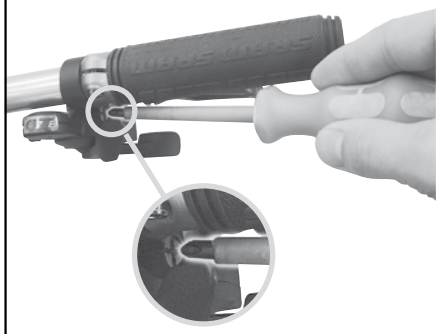

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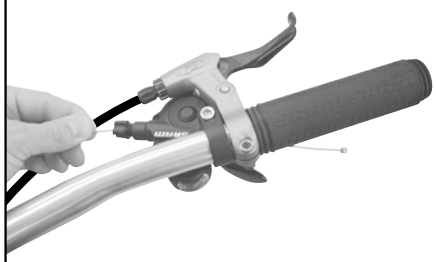

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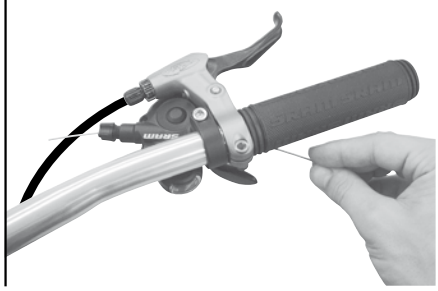


ASSEMBLY

• Slide first shifter then brake lever onto handlebar **(Figure 1)**.

• Slide the handlebar grip onto the handlebar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function.
For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Position the shifter as you wish. Locate the perfect position of shifter levers for your ergonomic needs. Tighten the 5 mm hex clamp bolt to 5 N•m (44 in-lb) **(Figure 2)**.

• Feed the cable through the cable housing and stops. Make sure the shifter is in gear position "1" (front shifter) or the HIGHEST gear number (rear shifter).

• Attach the shifter cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check for proper brake lever operation again!

CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

The shifter does not need to be opened.

Use only new high quality cable and compressionless cable housing with endcaps.

• Line-up the shifter in gear position "1" (front shifter) or the HIGHEST gear number (rear shifter).

• Detach the cable from the derailleur.

• Cut the cable off 6" (15 cm) from the shifter barrel adjuster. Discard the old cable and cable housing.

• Carefully unscrew cable change cap from cable entry with a screwdriver **(Figure 3)**.

• Push cable out of the cable entry with twisting movement **(Figure 4)**.

• Feed the new cable through the cable entry and out the barrel adjuster **(Figure 5)**.
It may be helpful to remove the barrel adjuster for better visibility.

• Replace cable change cap.

• Feed the cable through the new cable housing and cable stops.

• Attach the cable to the derailleur and adjust indexing per derailleur instructions.

MAINTENANCE

Clean the shifter using only water and mild soap.

95-7906-000.Rev.02

X.0 / X-9 / X-7 / ROCKET / ATTACK · TWIST SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	X.0				X-9	
Version	Shorty				Shorty	
Shifter Type	Front / Micro adjust	Front / Index	Rear 1:1 Actuation Ratio		Front / Micro adjust	Front / Index
Speeds	3		9	8		3
Derailleur	SRAM & Shimano		SRAM 1:1 Actuation Ratio		SRAM & Shimano	
Crankset	Triple Indexed	Triple Indexed			Triple Indexed	
Cable Pull Release	SRS				SRS	
Cable	Stainless Steel	Stainless Steel	PTFE Coated Stainless Steel		Stainless Steel	
Gear Indication	Window				Window	
Barrel Adjuster	Indexing				Indexing	
Clamping Diameter	22.1 – 22.3 mm				22.1 – 22.3 mm	
Shifter Length	70 mm				70 mm	

	X-9		X-7				Rocket
Version	Shorty		Shorty				Shorty
Shifter Type	Rear 1:1 Actuation Ratio		Front / Micro adjust	Front / Index	Rear 1:1 Actuation Ratio		Front / Micro adjust
Speeds	9	8		3	9	8	
Derailleur	SRAM 1:1 Actuation Ratio		SRAM & Shimano	SRAM & Shimano	SRAM 1:1 Actuation Ratio		SRAM & Shimano
Crankset			Triple Indexed	Triple Indexed			Triple Indexed
Cable Pull Release	SRS		SRS				SRS
Cable	Stainless Steel		Stainless Steel				Stainless Steel
Gear Indication	Window		Window				Window
Barrel Adjuster	Indexing		Indexing				Indexing
Clamping Diameter	22.1 – 22.3 mm		22.1 – 22.3 mm				22.1 – 22.3 mm
Shifter Length	70 mm		70 mm				70 mm

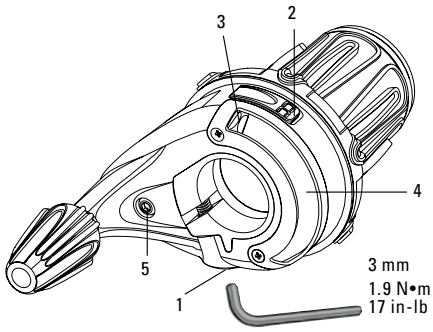
	Rocket			Attack			
Version	Shorty			Shorty			
Shifter Type	Front / Index	Rear 2:1 Actuation Ratio		Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio	
Speeds	3	9	8		3	9	8
Derailleur	SRAM & Shimano	Shimano		SRAM & Shimano	SRAM & Shimano	Shimano	
Crankset	Triple Indexed			Triple Indexed			
Cable Pull Release	SRS			SRS			
Cable	Stainless Steel			Stainless Steel			
Gear Indication	Window			Window			
Barrel Adjuster	Indexing			Indexing			
Clamping Diameter	22.1 – 22.3 mm			22.1 – 22.3 mm			
Shifter Length	70 mm			70 mm			

CABLE HOUSING

- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

X.0 / X-9 / X-7 / ROCKET / ATTACK · TWIST SHIFTERS
ASSEMBLY / MAINTENANCE

1



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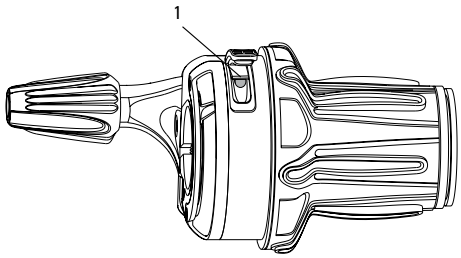

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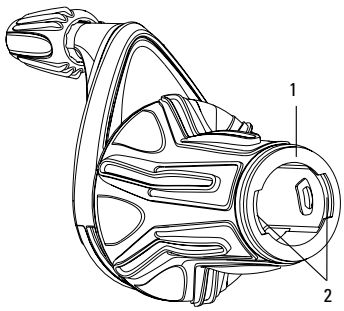

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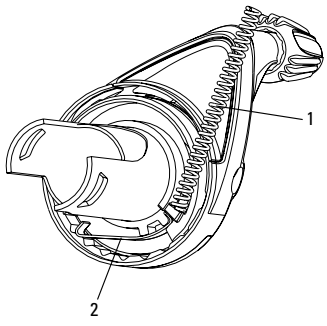
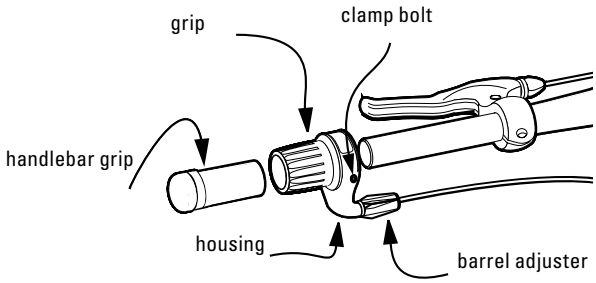


SHIFTER ANATOMY



ASSEMBLY

Front and Rear:

• Slide the shifter onto the handlebar.

– If necessary, move the brake lever to allow for shifter and handlebar grip.

– Bar end users – don't forget to leave room for the bar end.

• Rotate the shifter until the barrel adjuster is beneath (but out of the way of) the brake lever.

• Tighten the 3 mm hex clamp bolt (**1**, **Figure 1)** to 1.9 N•m (17 in-lb).

• Slide the handlebar grip onto the handlebar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function.
For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Feed the cable through the cable housing and stops.

• Attach cable to the derailleur.

• Adjust indexing per derailleur instruction.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check again for proper operation!

CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

No need to move other components. The shifter does not need to be opened.

Use only new high quality cable and compressionless cable housing with end caps.

Front and Rear:

• Detach the cable from the derailleur.

• Cut cable off 15 cm (6") from shifter barrel adjuster. Discard old cable and cable housing.

• From the edge (**2**, **Figure 1)**, pull open the cable change hatch. The hinge of the hatch should remain attached to the shifter.

• Rotate the shifter fully in the cable release direction (**3**, **Figure 1**). (Gear "1" on the front shifter or HIGHEST gear number on the rear shifter.)

• Look for cable head entry **(Figure 2)**.

• Using a small flat head screw driver, push back the tab (**1**, **Figure 2)** covering the cable head.

• Push cable up/out of the shifter and discard.

• Feed the new cable through the cable entry and out the barrel adjuster.

• Pull cable snug to seat cable head under tab.

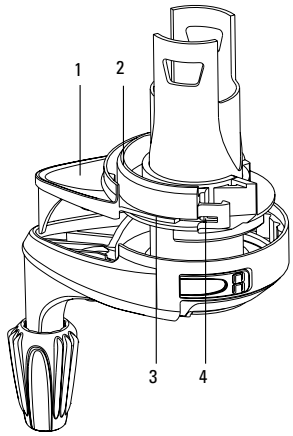
• Replace cable change hatch.

• Feed the cable through the new cable housing and frame stops.

• Attach cable to the derailleur.

• Adjust indexing per derailleur instruction.

5



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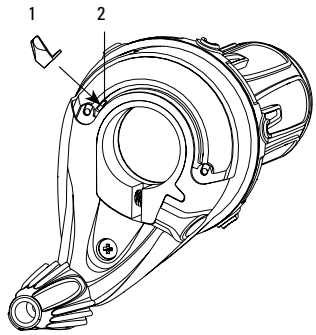


GRIP REPLACEMENT

ADVICE
Do not remove the triangular housing cover to make the change.

Removal:
• Rotate the shifter fully in the cable release direction (**3**, **Figure 1)**. (Gear "1" on the front shifter or HIGHEST gear number on the rear shifter.)

• Using a 3 mm hex wrench (**1**, **Figure 1)**, remove shifter from the handlebar.

• While holding shifter housing and grip together in one hand, remove axial fixture ring (**1**, **Figure 3)** by squeezing together housing tabs (**2**, **Figure 3**).

• While pushing/rotating the grip lightly forward (release direction), slowly move the grip outward away from housing.
– Pulling the grip quickly may cause the coil spring (**1**, **Figure 4)** to move out of position.

Replacement:
• Replace front end of coil spring (**1**, **Figure 4)** on to tab in groove if necessary.

• While sliding grip up towards the housing, align spring tab so that it catches the open end of the coil spring.

• Rotate grip forward slightly compressing the coil spring and engage grip and tab into the housing.

• Replace axial fixture ring (**1**, **Figure 3)** over housing tabs (**2**, **Figure 3**).

INTERNAL CLEANING

ADVICE
When shifting performance is compromised, try replacing the cable and housing before you disassemble the shifter for cleaning.

Disassembly:
• Follow "Grip Replacement / Removal".

• Remove lens cover (4, **Figure 1)**.

• Remove gear indicator needle (3, **Figure 1**) by pulling straight out.

• Remove the spool's coil spring (1, **Figure 4)**.

• Using small pliers, pull leaf spring (2, **Figure 4**) straight out. Take note of the shape of the spring so that you can replace it in the correct direction.

• Remove housing cover screw (**5**, **Figure 1)**. Slide housing cover (**1**, **Figure 5)** and spool (**2**, **Figure 5**) out at the same time being careful not to break the tab (**3**, **Figure 5**) on the cover.

• Clean all parts with soapy water only.

• Using only Grip Shift Jonnisnot, grease housing tube, detentes and cable track at housing bend.

Reassembly:
• Slip tab (**3**, **Figure 5)** on housing cover into groove (**4**, **Figure 5**) on spool.

• Slide spool and cover into housing and install cover screw (**5**, **Figure 1)**.

• Place leaf spring (**2**, **Figure 4)** into spool. Push down slightly on opposite end of spring, then seat spring completely into spool and housing.

• Follow "Grip Replacement / Replacement".

• Rotate shifter to full release position.

• Install gear indication needle (**1**, **Figure 6)** in slot (**2**, **Figure 6**).

• Replace gear indicator lens (**4**, **Figure 1)** and screws.

• Install shifter on to bars and check for proper function.

X-5 / CENTERA · TWIST SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

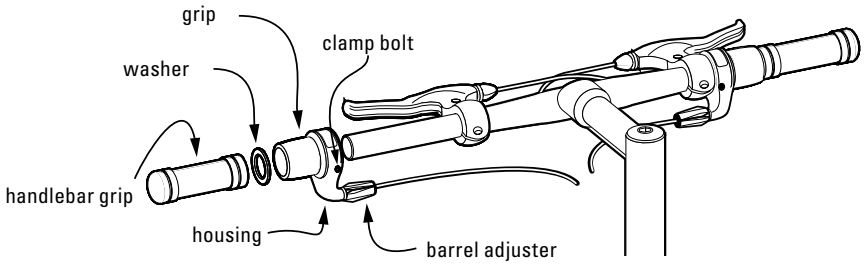
	X-5			
Version	Shorty			
Shifter Type	Front / Micro adjust	Front / Index	Rear 1:1 Actuation Ratio	Rear 1:1 Actuation Ratio
Speeds		3	9	8
Derailleur	SRAM & Shimano		SRAM 1:1 Actuation Ratio	
Crankset	Triple Indexed			
Cable Pull Release	FFS		Standard	
Cable	Die Drawn Steel			
Gear Indication	Printed			
Barrel Adjuster	Indexing			
Clamping Diameter	22.1 – 22.3 mm			
Shifter Length	65 mm			

	Centera			
Version	Shorty			
Shifter Type	Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio	Rear 2:1 Actuation Ratio
Speeds		3	9	8
Derailleur	SRAM & Shimano		Shimano	
Crankset	Triple Indexed			
Cable Pull Release	FFS		Standard	
Cable	Die Drawn Steel			
Gear Indication	Printed			
Barrel Adjuster	Indexing			
Clamping Diameter	22.1 – 22.3 mm			
Shifter Length	65 mm			

CABLE HOUSING

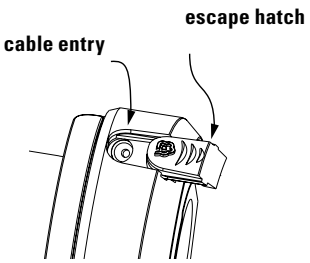
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY



X-5 / CENTERA · TWIST SHIFTERS
ASSEMBLY

1



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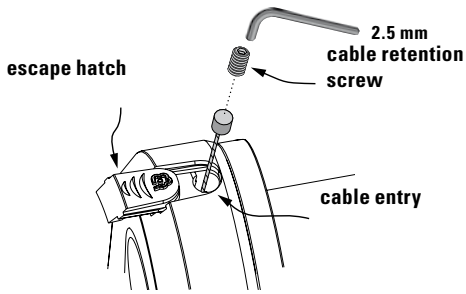

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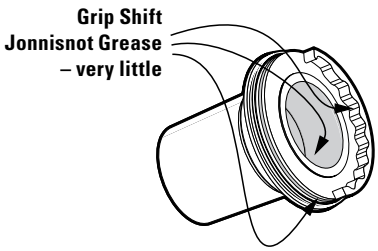
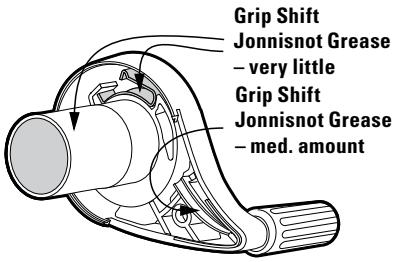




ASSEMBLY

Front and Rear:

• Slide the shifter onto the handlebar.

– If necessary, move the brake lever to allow for shifter and handlebar grip.

– Bar end users – don't forget to leave room for the bar end.

• Rotate the shifter until the barrel adjuster is beneath (but out of the way of) the brake lever.

• Tighten the 3 mm hex clamp bolt to 1.9 N•m (17 in-lb).

• Slide the plastic washer onto the handlebar.

• Slide the handlebar grip onto the handlebar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Feed the cable through the cable housing and stops.

• Attach the shifter cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION:
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check again for proper operation.

X-4 / MRX PRO · TWIST SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

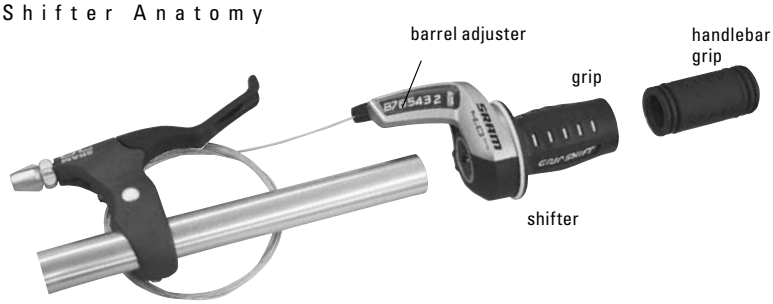
	X-4				
Version	Half Pipe				
Shifter Type	Front / Micro adjust	Front / Index	Rear 1:1 Actuation Ratio		
Speeds		3	9	8	7
Derailleur	SRAM & Shimano		SRAM 1:1 Actuation Ratio		
Crankset	Triple Indexed				
Cable Pull Release	SRS				
Cable	Die Drawn Steel				
Gear Indication	Window				
Barrel Adjuster	Indexing				
Clamping Diameter	22.1 – 22.3 mm				
Shifter Length	86 mm				

	MRX Pro							
Version	Half Pipe							
Shifter Type	Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio			Shimano Rapid Rise		
Speeds		3	9	8	7	9	8	7
Derailleur	SRAM & Shimano		Shimano			Shimano Rapid Rise		
Crankset	Triple Indexed							
Cable Pull Release	SRS							
Cable	Die Drawn Steel							
Gear Indication	Window							
Barrel Adjuster	Indexing							
Clamping Diameter	22.1 – 22.3 mm							
Shifter Length	86 mm							

CABLE HOUSING

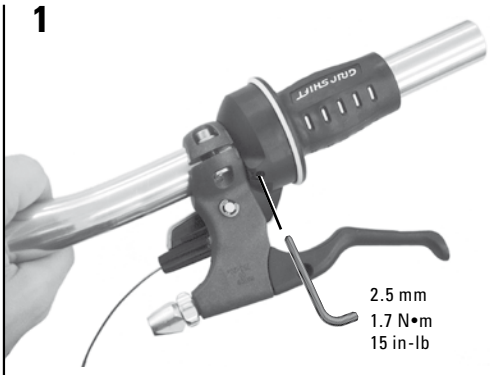
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

Shifter Anatomy



X-4 / MRX PRO · TWIST SHIFTERS
ASSEMBLY / MAINTENANCE

1



2

3

4

ASSEMBLY

Front and Rear:

• Slide the shifter onto the handlebar.

– If necessary, move the brake lever to allow for shifter and handlebar grip.

– Bar end users – don't forget to leave room for the bar end.

• Rotate the shifter until the barrel adjuster is above (but out of the way of) the brake lever and the gear indication is clearly visible from the riding position.

• Tighten the 2.5 mm hex clamp bolt **(Figure 1)** to 1.7 N•m (15 in-lb).

• Slide the handlebar grip onto bar **(Figure 2)**.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Feed the cable through the cable housing and frame stops.

• Attach cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION
Not recommended for use on thin walled alluminum handlebars such as Hyperlite® type handlebars or Carbon handlebars.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check again for proper operation!

CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

No need to move other components. The shifter does not need to be opened.

Use only new high quality cable and compressionless cable housing with endcaps.

• Detach the cable from the derailleur.

• Cut the cable off 6" (15 cm) from the shifter barrel adjuster.

• Discard the old cable and cable housing.

• Line up the "1" (front) or HIGHEST gear number (rear) mark with the indicator mark (MRX Pro Shimano Rapid Rise® Gear number "1" for front and rear). Look for the cable entry.

• Push cable up/out of the shifter and discard **(Figure 3)**.

• Feed the new cable through the cable entry and out the barrel adjuster **(Figure 4)**.

• Pull the cable snug.

• Feed the cable through the new cable housing and stops.

• Attach the cable to the derailleur and adjust indexing per the derailleur instructions.

MAINTENANCE

Clean all shifter parts using only water and mild soap.

3.0 COMP / MRX COMP · TWIST SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

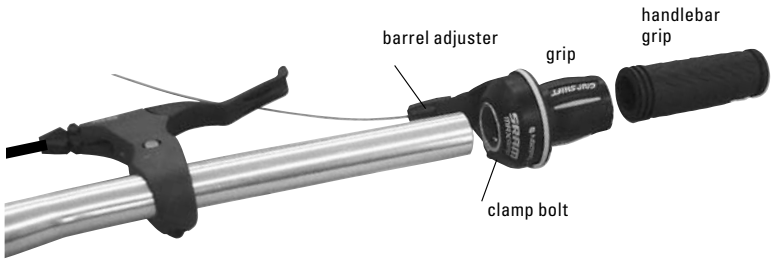
	3.0 Comp				
Version	Shorty				
Shifter Type	Front / Micro adjust	Front / Index	Rear 1:1 Actuation Ratio		
Speeds	3	3	8	7	6
Derailleur	SRAM & Shimano		SRAM 1:1 Actuation Ratio		
Crankset	Triple Indexed				
Cable Pull Release	SRS				
Cable	Standard Steel				
Gear Indication	Printed				
Barrel Adjuster	Friction				
Clamping Diameter	22.1 – 22.3 mm				
Shifter Length	67 mm				

	MRX Comp							
Version	Shorty							
Shifter Type	Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio			Rear Shimano Rapid Rise		
Speeds		3	9	8	7	9	8	7
Derailleur	SRAM & Shimano		Shimano			Shimano Rapid Rise		
Crankset	Triple Indexed							
Cable Pull Release	SRS							
Cable	Standard Steel							
Gear Indication	Printed							
Barrel Adjuster	Friction							
Clamping Diameter	22.1 – 22.3 mm							
Shifter Length	67 mm							

CABLE HOUSING

- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY

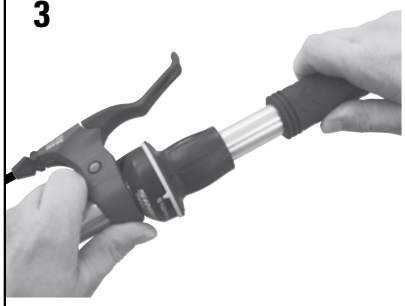


3.0 COMP / MRX COMP · TWIST SHIFTERS ASSEMBLY / MAINTENANCE

1

2

3



4

5

ASSEMBLY

• Slide the shifter onto the handlebar **(Figure 1)**.

– If necessary, move the brake lever to allow for shifter and stationary grip.

– Bar end users – don't forget to leave room for the bar end.

• Rotate the shifter until the barrel adjuster is beneath (but out of the way of) the brake lever.

• Tighten the 2.5 mm hex clamp bolt **(Figure 2)** to 1.7 N•m (15 in-lb).

• Slide the stationary grip onto the handlebar **(Figure 3)**.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Feed the cable through the cable housing and frame stops.

• Attach cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION
Not recommended for use on thin walled alluminum handlebars such as Hyperlite® type handlebars or Carbon handlebars.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check again for proper operation

CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

No need to move other components. The shifter does not need to be opened.

Use only new high quality cable and compressionless cable housing with endcaps.

• Detach the cable from the derailleur.

• Cut the cable off 6" (15 cm) from the shifter barrel adjuster.

• Discard the old cable and cable housing.

• Line up the "1" (front) or HIGHEST gear number (rear) mark with the indicator mark (MRX Pro Shimano Rapid Rise® Gear number "1" for front and rear). Look for the cable entry.

• Push cable up/out of the shifter and discard **(Figure 4)**.

• Feed the new cable through the cable entry and out the barrel adjuster **(Figure 5)**.

• Pull the cable snug.

• Feed the cable through the new cable housing and stops.

• Attach the cable to the derailleur and adjust indexing per the derailleur instructions.

MAINTENANCE

Clean the shifter using only water and mild soap.

3.0 PLUS / 3.0 / MRX PLUS / MRX · TWIST SHIFTERS
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	3.0 Plus Half Pipe / 3.0 Shorty							
Version	3.0 Plus	3.0	3.0 Plus	3.0	3.0 Plus	3.0	3.0 Plus	3.0
Shifter Type	Front / Micro adjust		Front / Index		Rear 1:1 Actuation Ratio		Rear 1:1 Actuation Ratio	
Speeds	3		3		8		7	
Derailleur	SRAM & Shimano				SRAM 1:1 Actuation Ratio			
Crankset	Triple Indexed							
Cable Pull Release	FFS				Standard			
Cable	Die Drawn Steel							
Gear Indication	Printed							
Barrel Adjuster	Indexing							
Clamping Diameter	22.1 – 22.3 mm							
Shifter Length	96 mm	64 mm	96 mm	64 mm	96 mm	64 mm	96 mm	64 mm

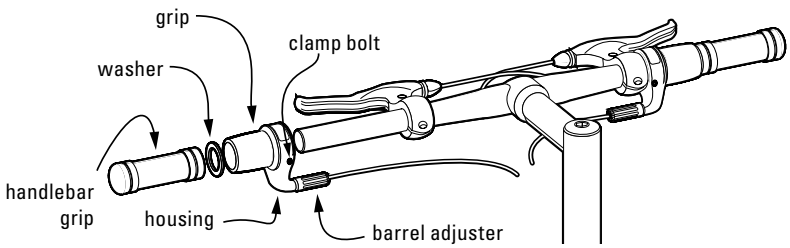
	MRX Plus Half Pipe					
Version	Half Pipe					
Shifter Type	Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio		Rear Shimano Rapid Rise	
Speeds	3	3	8	7	8	7
Derailleur	SRAM & Shimano		Shimano		Shimano Rapid Rise	
Crankset	Triple Indexed					
Cable Pull Release	FFS direct		Standard			
Cable	Die Drawn Steel					
Gear Indication	Printed					
Barrel Adjuster	Indexing					
Clamping Diameter	22.1 – 22.3 mm					
Shifter Length	96 mm					

	MRX								
Version	Shorty								
Shifter Type	Front / Micro adjust	Front / Index	Rear 2:1 Actuation Ratio				Rear Shimano Rapid Rise		
Speeds	3	3	8	7	6	5	8	7	6
Derailleur	SRAM & Shimano		Shimano				Shimano Rapid Rise		
Crankset	Triple Indexed								
Cable Pull Release	FFS direct		Standard						
Cable	Die Drawn Steel								
Gear Indication	Printed								
Barrel Adjuster	Indexing								
Clamping Diameter	22.1 – 22.3 mm								
Shifter Length	64 mm								

CABLE HOUSING

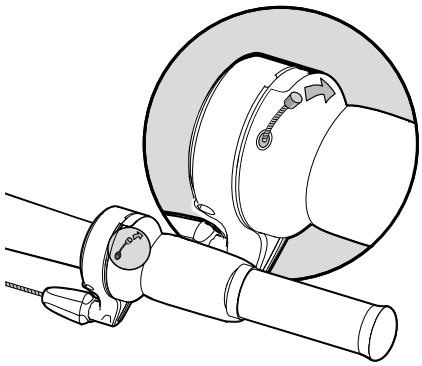
- Use only new high quality cable and compressionless cable housing with end caps.
- When choosing cable housing lengths, be sure to allow enough housing for an extreme turn of the handlebars in both directions.
- Note also, that different stem lengths and cable stop positions effects cable housing length.

SHIFTER ANATOMY



3.0 COMP / MRX COMP · TWIST SHIFTERS
ASSEMBLY / MAINTENANCE

1



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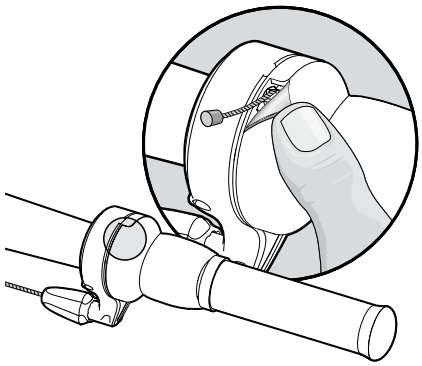

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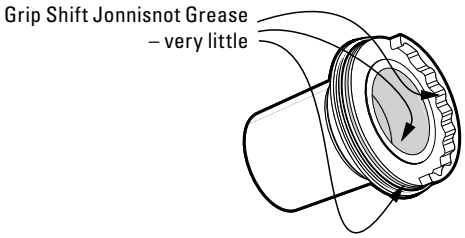
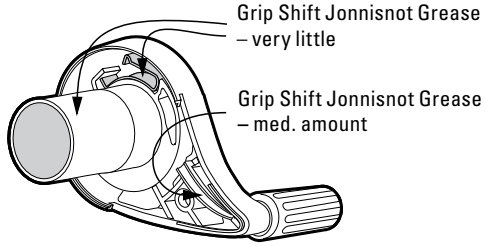




ASSEMBLY

Front and Rear:

• Slide the shifter onto the handlebar.

– If necessary, move the brake lever to allow for shifter and handlebar grip.

– Bar end users – don't forget to leave room for the bar end.

• Rotate the shifter until the barrel adjuster is beneath (but out of the way of) the brake lever.

• Tighten the 2.5 mm hex clamp bolt to 1.7 N•m (15 in-lb).

• Slide the plastic washer onto the handlebar.

• Slide the handlebar grip onto bar.

CAUTION
Never use lubricants or solvents to install handlebar grips. Handlebar grips provide safety function. For this reason, they should be mounted in such a way as to make sure they do not slip off handlebar!

• Feed the cable through the cable housing and frame stops.

• Attach cable to the derailleur.

• Adjust indexing per derailleur instructions.

CAUTION
Not recommended for use on thin walled alluminum handlebars such as Hyperlite® type handlebars or carbon handlebars.

CAUTION
Always check the front and rear brake levers for proper operation.

If there is interference between shifters and brake levers, re-adjust lever and shifter placement.

Check again for proper operation.

CABLE CHANGE

ADVICE
Leave the shifter on the handlebar.

No need to move other components. The shifter does not need to be opened.

Use only new high quality cable and compressionless cable housing with endcaps.

3.0 Plus / MRX Plus: Figure 1

3.0 / MRX: Figure 2

• Detach the cable from the derailleur.

• Cut the cable off 15 cm (6") from shifter barrel adjuster. Discard old cable and cable housing.

• Rotate the shifter until the cable entry is visible.

• 3.0 / MRX only: Carefully peel back the corner of the grip cover shown in **Figure 2**. Use your fingernail or a small screwdriver.

• Remove and discard the rest of the old cable.

• Feed the new cable through the cable entry in the grip and out through the barrel adjuster.

• Feed the cable through the new cable housing and stops.

• Attach the cable to the derailleur and adjust indexing per derailleur instruction.

MAINTENANCE

• Clean all shifter parts using only water and mild soap.

• Use only Grip Shift Jonnisnot Grease for any shifter lubrication.

• After proper cleaning relubricate the areas shown in **Figure 3**.

CASSETTES · MTB / ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	PG 990		PG 980	
Application	MTB		MTB	
Technology	Power Glide II		Power Glide II	
Largest Cog	34 T	32 T	34 T	32 T
Speeds	9		9	
Chains	SRAM / 9 speed index			
Hubs	9 / 8 speed HG			
Cogs	11/13/15/17/21/23/26/30/34	11/12/14/16/18/21/24/28/32	11/13/15/17/21/23/26/30/34	11/12/14/16/18/21/24/28/32
Lockring Torque	40 N•m			
Cog Material	SAPH 440 steel			
Spider Material	Aluminum, forged		Aluminum	
Lockring Material	Aluminum, anodized		Chrome Plated, Satin	
Rivet Material	Stainless Steel			
Finish	Pearl Ni-Chrome Plated			

	PG 970				
Application	MTB	MTB	Road	Road	Road
Technology	Power Glide II				
Largest Cog	34 T	32 T	26 T	23 T	23 T
Speeds	9				
Chains	SRAM / 9 speed index				
Hubs	9 / 8 speed HG				
Cogs	11/13/15/17/20/23/26/30/34	11/12/14/16/18/21/24/28/32	12/13/14/15/17/19/21/23/26	12/13/14/15/16/17/19/21/23	11/12/13/14/15/17/19/21/23
Lockring Torque	40 N•m				
Cog Material	SAPH 440 steel				
Spider Material	Chrome Plated, Satin		Aluminum, anodized		
Lockring Material	Aluminum, anodized		Chrome Plated, Satin		
Rivet Material	Steel / Zinc Coat				
Finish	Chrome Plated, Satin		Ni-Chrome Plated		

	PG 970	PG 950			
Application	Road	MTB	MTB	Road	Road
Technology	Power Glide II				
Largest Cog	21 T	34 T	32 T	26 T	26 T
Speeds	9				
Chains	SRAM / 9 speed index				
Hubs	9 / 8 speed HG				
Cogs	11/12/13/14/15/16/17/19/21	11/13/15/17/20/23/26/30/34	11/12/14/16/18/21/24/28/32	12/13/14/15/17/19/21/23/26	11/12/13/15/17/19/21/23/26
Lockring Torque	40 N•m				
Cog Material	SAPH 440 steel	Steel	Steel	SAPH 440 steel	SAPH 440 steel
Lockring Material	Aluminum, anodized	Forged Steel			
Screw Material	Steel / Zinc Coat				
Finish	Chrome Plated, Satin		Ni-Chrome Plated		

CASSETTES · MTB / ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

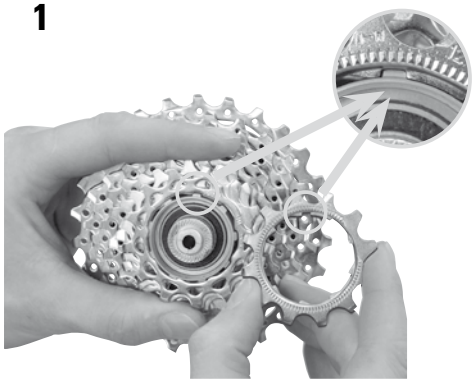
	PG 950	
Application	Road	Road
Technology	Power Glide II	
Largest Cog	28 T	23 T
Speeds	9	
Chains	SRAM / 9 speed index	
Hubs	9 / 8 speed HG	
Cogs	11/12/13/14/16/18/21/24/28	12/13/14/15/16/17/19/21/23
Lockring Torque	40 N•m	
Cog Material	SAPH 440 steel	
Lockring Material	Forged steel	
Screw Material	Steel / Zinc Coat	
Finish	Ni-Chrome Plated	

	PG 950				
Application	MTB	MTB	MTB	Road	Road
Technology	Power Glide II				
Largest Cog	32 T	30 T	28 T	26 T	23 T
Speeds	8				
Chains	SRAM / 8 speed index				
Hubs	9 / 8 speed HG				
Cogs	11/12/14/16/18/21/26/32	11/13/15/17/20/23/26/30	11/12/14/16/18/21/24/28	12/13/15/17/19/21/23/26	12/13/14/15/17/19/21/23
Lockring Torque	40 N•m				
Cog Material	SAPH 440 steel				
Lockring Material	Forged steel				
Screw Material	Steel / Zinc Coat				
Finish	Ni-Chrome Plated				

	PG 830 / PG 820			PG 730
Application	MTB	MTB	MTB	MTB
Technology	Power Glide II			
Largest Cog	32 T	30 T	28 T	32 T
Speeds	8			7
Chains	SRAM / 8 speed index			SRAM / 8 speed index
Hubs	9 / 8 speed HG			
Cogs	11/12/14/16/18/21/26/32	11/13/15/17/20/23/26/30	11/12/14/16/18/21/24/28	12/14/16/18/21/26/32
Lockring Torque	40 N•m			
Cog Material	Steel			
Lockring Material	Forged steel			
Screw Material	Steel / Zinc Coat			
Finish	PG 830: Ni-Chrome Plated / PG 820: Black Phosphate			Ni-Chrome Plated

CASSETTES · MTB / ROAD
ASSEMBLY / MAINTENANCE

1



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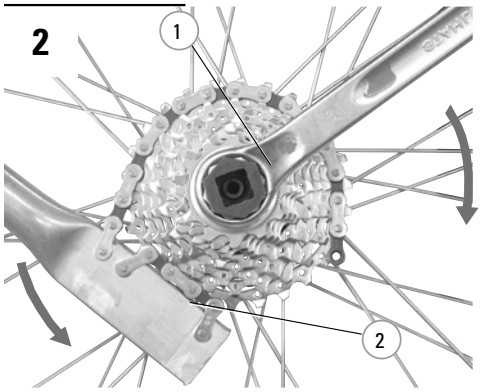

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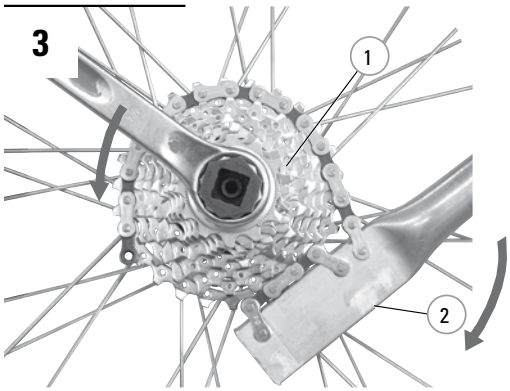


ASSEMBLY

• Position the cassette cluster and individuel sprockets on the cassette body by aligning the spline pattern **(Figure 1)**.

• Screw the lockring in to the cassette body and tighten it to 40 N•m (350 in-lb) by using a cassette tool (**1**, **Figure 2)** like the Park Tool® FR-5 or Shimano® and a chain wrench (**2**, **Figure 2**).

• Adjust the rear derailleur according to the installation advice from the derailleur manufacturer.

ADVICE
Due to the optimized stability of the rear wheel, there is less space between the right spoke flange and the cassette. This means that not all spoke protector discs available on the market will fit. Please carry out a trial assembly run before specifying spoke protector
discs (spoke protector discs must not rub against the cassette).

MAINTENANCE

ADVICE
The only maintenance necessary on the cassette is to replace worn sprockets.

If the chain jumps repeatedly on a sprocket with correct derailleur setting it might be sufficient to replace only the chain.
If the new chain also jumps on the sprocket the sprocket is worn out and should be replaced.

Always put on a new chain when you replace worn sprockets.

To replace the sprocket do as follows:

• Remove the lockring by using cassette tool (**1**, **Figure 3)** and a chain wrench (**2**, **Figure 3**) to hold the cassette.

• Disassemble the sprocket cluster by unscrewing the small bolt on the back of the cassette.

• Replace worn or damaged sprocket and re-assemble sprockets and spacers in the correct order and re-install the bolt.

• Make sure that all the splines on the cogs are aligned to each other and the cassette body pattern.

• Tighten the cassette with 40 N•m (350 in-lb) (see **ASSEMBLY**).

POWER CHAINS · MTB / ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	PC 991	PC 991 Hollow Pin	PC 991 Cross Step	PC 971	PC 951
Application	MTB / Road				
Max. Number of Sprockets	9 only				
Compatibility Front	Truvativ / HG / EXA-Drive				
Compatibility Rear	HG / PG / EXA-Drive				
Dimensions	1/2" x 11/128"				
Length	6.65 mm	6.35 mm	6.65 mm	6.65 mm	6.65 mm
Riveting	Step	Cylindrical	Cross Step	Step	Step
Chrome Hardened	Yes				
Push Power	2000 N / 450 lbs.	2000 N / 450 lbs.	2500 N / 562 lbs.	2000 N / 450 lbs.	2000 N / 450 lbs.
Min. Tensile Strength	9000 N / 2023 lbs.				
External Pin Plate	Nickel Plated				Grey
Internal Pin Plate	Nickel Plated			Grey	Grey
Connecting Method[1]	Power Link Gold or Pin	Power Link Gold	Power Link Gold	Power Link Gold or Pin	Power Link Gold or Pin

[1] Caution: Hollow Pin and Cross Step chains connecting method: with Power Link only (no pin)!

	PC 890	PC 870	PC 850	PC 830 Saltshaker	PC 830
Application	MTB / Road				
Max. Number of Sprockets	Maximum 8				
Compatibility Front	HG / IG / PG / EXA-Drive			HG / IG / EXA-Drive	
Compatibility Rear	HG / HG-I / IG / PG / EXA-Drive				
Dimensions	1/2" x 3/32"				
Length	7 mm				
Riveting	Step				
Chrome Hardened	Yes			No	
Push Power	2000 N / 450 lbs.			1300 N / 292 lbs.	1500 N / 340 lbs.
Min. Tensile Strength	9000 N / 2023 lbs.				
External Pin Plate	Silver / Nickel Plated		Grey / Polished	Light Grey	Grey / Polished
Internal Pin Plate	Silver / Nickel Plated	Grey / Polished	Grey / Polished	Light Grey	Grey / Polished
Connecting Method[1]	Power Link Silver	Power Link Silver or Pin		Power Link SS2 or Pin	Power Link Silver or Pin

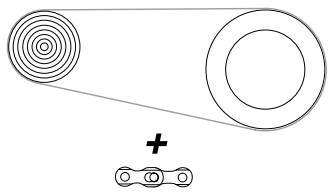
POWER CHAINS · MTB / ROAD
TECHNICAL DATA / ASSEMBLY REQUIREMENTS

	PC 10 Saltshaker	PC 10	PC 10C
Application	MTB		
Max. Number of Sprockets	Maximum 7		
Compatibility Front	Single / HG		
Compatibility Rear	Single / HG		
Dimensions	1/2" x 3/32"		
Length	6.9 mm		7.1 mm
Riveting	Step		
Chrome Hardened	No		
Push Power	1000 N / 225 lbs.		
Min. Tensile Strength	9000 N / 2023 lbs.		
External Pin Plate	Light Grey	Brown	Light Grey
Internal Pin Plate	Light Grey	Brown	Light Grey
Connecting Method	Power Link SS1 or Pin	Power Link Grey or Pin	Pin only

	PC 1 Saltshaker	PC 1 Ni	PC 1
Application	Gear Hubs		
Max. Number of Sprockets	1		
Compatibility Front	Single		
Compatibility Rear	Single		
Dimensions	1/2" x 1/8"		
Length	7.8 mm		8.9 mm
Riveting	Step		V Shape
Chrome Hardened	No		
Push Power	800 N / 180 lbs.		
Min. Tensile Strength	9000 N / 2023 lbs.		
External Pin Plate	Light Grey	Silver / Nickel Plated	Brown
Internal Pin Plate	Light Grey	Silver / Nickel Plated	Brown
Connecting Method	Snap Lock or Pin	Snap Lock, 3pcs Connection Link or Pin	

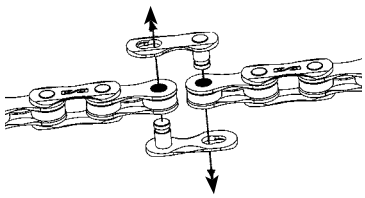
POWER CHAINS · MTB / ROAD
ASSEMBLY / MAINTENANCE

1



(1 Link + Power Lock)

2



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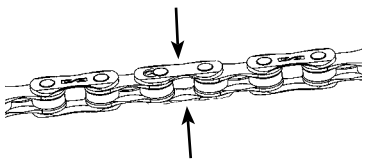

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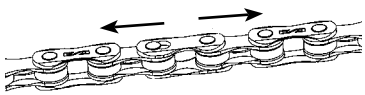

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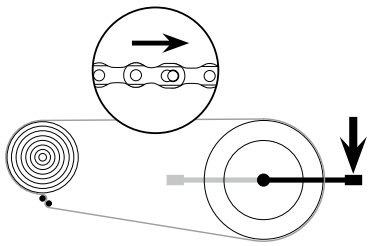

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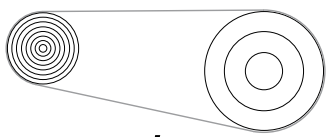


(2 links)

PC 1090R / PC 1090 / PC 1070 / PC 1050 / PC 1030 (1/2" X 11/128")

Chain length:
(A chain tool will be required to shorten the chain.)

Replacing a worn chain:
• Measure the worn chain and shorten the new to the same length.

Initial assembly:
• Shorten the chain to the length specified by the derailleur manufacturer.

SRAM derailleurs:
• Place the chain over largest front chainwheel and largest rear sprocket and add 1 link + Power Lock **(Figure1)**.

CLOSING CHAIN WITH POWER LOCK

CAUTION
Use Power Lock only with SRAM chains!

Use only Power Lock to close 10 speed chains (no Pin)!

Use only Power Lock (black coloured) for PC 1090R, PC 1090, PC 1070, PC 1050, PC 1030 to avoid material damage or the rider falling from the bicycle resulting in injury.

• Fit chain, insert both halves of the Power Lock into the chain ends **(Figure 2)** and bring the ends together **(Figure 3**) on the bottom side of the drivetrain (no tension side).

• Pull chain apart until you feel some resistance **(Figure 4)**.

• Rotate the chain so the Power Lock is positioned on the top side of the drivetrain **(Figure 5)**.

• Pedal forward while holding bike firmly in place **(Figure 5**) until you hear click sound. The Power Lock is now in place and safely closed.

Opening:
Once the Power Lock is installed it can only be removed by means of a Chain tool.

CAUTION
Power Lock is for one-time use only!

Always use a new Power Lock when fitting a new chain.

Failure to shorten the chain properly or to lock it exactly into place may cause damage to the chain and eventually total chain failure, material damage, or the rider falling from the bicycle resulting in injury.

Worn sprockets should also be replaced when a new chain is fitted.

PC 991 / PC 971 / PC 951 / PC 890 / PC 870 / PC 850 / PC 830 / PC 10 (1/2" X 3/32" AND 1/2" X 11/128")

Chain length:
(A chain tool will be required to shorten the chain.)

Replacing a worn chain:
• Measure the worn chain and shorten the new to the same length.

Initial assembly:
• Shorten the chain to the length specified by the derailleur manufacturer.

SRAM derailleurs:
• Place the chain over largest front chainwheel and largest rear sprocket (**Figure 6**). For rear suspension frame, position the rear suspension for the greatest chain length required.

• Add 2 links or 1 link + Power Link **(Figure 6)**.

CLOSING CHAIN WITH POWER LOCK

CAUTION
Use Power Link only with SRAM chains!

Use only Power Link to close Hollow Pin chains and Cross Step chains (no Pin)!

Use only as specified, to avoid material damage or the rider to fall off his bicycle resulting in injury:

Power Link Gold (gold colored):
for PC 991 Hollow Pin, PC 991 Cross Step, PC 991, PC 971, PC951

Power Link Silver (silver coloured):
for PC 890, PC 870, PC 850, PC 830

Power Link SS2 (light grey coloured):
for PC 830 Saltshaker

Power Link SS1 (light grey coloured):
for PC 10 Saltshaker

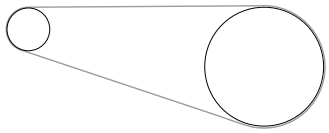
Power Link Grey (grey coloured):
for PC 10

Closing:
• Fit chain, bring the ends together and insert both halves of the Power Link into the chain ends. (**Figure** 2)

• Press both halves of the Power Link together (**Figure** 3) and lock in place by pulling the chain apart. **(Figure 4)**

Opening:
Press both plates of the Power Link together (**Figure** 3) while sliding the chain ends together (unlock). Remove the two halves of the link from the chain ends.

7



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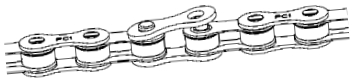

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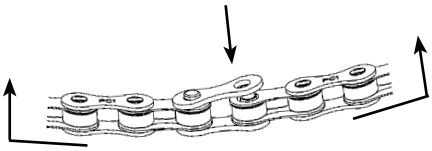

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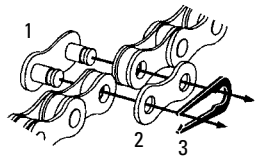

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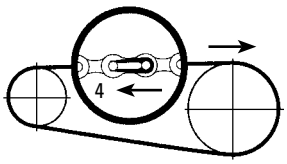

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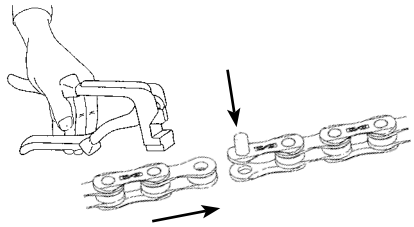

CAUTION
Always use a new Power Link when fitting a new chain.

Failure to shorten the chain properly or to lock it exactly into place may cause damage to the chain and eventually total chain failure, material damage, or the rider falling from the bicycle resulting in injury.

Worn sprockets should also be replaced when a new chain is fitted.

CLOSING STANDARD VERSION WITH CLAMPING PIN

Fit chain, bring the two ends together and press pin through with assembly tool **(Figure 12). The pin must extend by the same amount at both outer plates. It must be possible to move the connecting link slightly.**

PC 1
(1/2" X 1/8")

Chain length:
(A chain tool will be required to shorten the chain.)

Replacing a worn chain:
• Measure the worn chain and shorten the new to the same length.

Initial assembly:
• Shorten the chain to the length specified by the drivetrain manufacturer.

SRAM components:
• Place the chain over front chainwheel and rear sprocket **(Figure 7)**. For rear suspension frame, position the rear suspension for the greatest chain length required.

CLOSING CHAIN WITH SNAP LOCK

CAUTION:
Use Snap Lock only with SRAM chains!

• Fit the shortened chain, bring the ends together and connect with the Snap Lock. Place the outer plate on one pin **(Figure 8)**.

• Gently flex the chain until the outside connector plate snaps into position over the second pin **(Figure 9)**.

CAUTION
Make sure plate is fully seated in the pin channel and plates are parallel to each other.

If movement of the connector plate is noticed a new Snap Lock must be used.

Snap Lock is for one-time use only!

Always use a new Snap Lock when fitting a new chain.

Failure to shorten the chain properly or to lock it exactly into place may cause damage to the chain and eventually total chain failure, material damage, or the rider falling from the bicycle resulting in injury.

Worn sprockets should also be replaced when a new chain is fitted.

CLOSING CHAIN WITH 3 PIECE CONNECTION LINK

• Fit the shortened chain, bring the two ends together and connect with the chain lock. The chain lock consists of an outer plate with pins (**1**, **Figure 10**), an outer plate (**2**) and a retaining spring (**3**, **Figure 10**).

• Insert outer plate with pins (**1**, **Figure 10**) into the chain ends, attach outer plate (**2**, **Figure 10**) and press chain lock together (1+2).

• Attach retaining spring (**3**, **Figure 10**) with the closed end of the retaining ring pointing in the direction of chain travel (**Figure 10**).

• Slide retaining spring in the direction of arrow (**4**, **Figure 11**) to engage it in the grooves in the pins.

CLOSING STANDARD VERSION WITH CLAMPING PIN

Fit chain, bring the two ends together and press pin (**Figure 12**) through with assembly tool. **The pin must extend by the same amount at both outer plates. It must be possible to move the connecting link slightly.**

MAINTENANCE

• Clean dirty chains before oiling. Do not use any acidic agents. Cleaning agent must be rinsed off after a few minutes with water. Apply oil after chain is completely dried.

• Regular lubrication will extend the chain's service life. Apply oil to the chain links rollers and allow to work in.

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