GRIP SHIFT™

ESP OPERATING SYSTEM™

'97 Technical Manual

SRAM Corporation

CHICAGO, ILLINOIS U.S.A. • THE NETHERLANDS • IRELAND • TAIWAN • CHINA

GRIP SHIFT REFERENCE CHART

These charts represent SRAM's recommendations for use of GRIP SHIFT shifters with Shimano™ derailleurs . These recommendations include using Shimano™ cranks, chains, cassettes and chain rings, or compatible components.

Rear Shifters	Shimano Rear Derailleurs									
	XTR	Deore XT	Deore LX	STX RC	STX	ALIVIO	ACERA X	ALTUS 7speed	ALTUS 6speed	TOURNEY 5speed
SRT 800-81	●	●	●							
SRT 600-81		●	●	●						
SRT 450-81			●	●						
SRT 450-71				●	●	●				
SRT 400-81				●			●			
SRT 400-71				●	●	●	●			
MRX 170-71						●	●	●		
MRX 170-61									●	
MRX 170-51										●

Note: "-81" = 8 speed & "-71" = 7 speed

Front Shifters	Shimano Front Derailleurs								
	XTR	Deore XT	Deore LX	STX RC	STX	ALIVIO	ACERA X	ALTUS	TOURNEY
SRT 800-11	●	●	●						
SRT 800-32	●	●	●	●					
SRT 600-11		●	●	●	●				
SRT 600-32		●	●	●	●	●	●		
SRT 450-11			●	●	●	●	●		
SRT 450-32				●	●	●	●		
SRT 400-11				●	●	●	●		
SRT 400-32				●	●	●	●		
MRX 170-11						●	●	●	●
MRX 170-32						●	●	●	●

Note: "-11" = Friction Trim & "-32" = Dual SIS Index

Internal Hub (IH) Shifters	Internally Geared Hubs	
	NEXUS Inter 7speed	NEXUS Inter 4speed
SRT 400-73	●	
SRT 400-41		●
MRX-170-41		●

GRIP SHIFT™

ESP COMPONENTS REFERENCE CHART

Rear Shifters	Rear Derailleurs		
	ESP 9.0	ESP 7.0	ESP 5.0
ESP 900-81	•	•	•
ESP 700-81	•	•	•
ESP 500-81			•
ESP 500-71			•

Note: "-81" = 8 speed & "-71" = 7 speed

Front Shifters	Front Derailleurs			
	XTR	Deore XT	Deore LX	Deore STX RC
ESP 900-11	•	•	•	
ESP 900-32	•	•	•	
ESP 700-11		•	•	
ESP 700-32		•	•	
ESP 500-11			•	•
ESP 500-32			•	•

Note: "-11" = Friction Trim & "-32" = Dual SIS Index

For further information regarding ESP system compatibility see page 27

ESP OPERATING SYSTEM™

INTRODUCTION

For model year 1997 we have improved and expanded our product line with several new models and upgrades. Foremost, we are expanding the SRAM ESP Derailleur Systems to three rear derailleur models and their respective shifters: ESP 9.0 and ESP 900 shifters, ESP 7.0 and ESP 700 shifters, and the ESP 5.0 and ESP 500 shifters. Added to the upgraded Grip Shift line are the shorter rotation MRX 170, as well as the SRT 400 IH and MRX 170 IH internal hub compatible shifters.

This manual covers the complete spare parts descriptions and servicing tips for both the1997 ESP and Grip Shift components. We've also included a bird's eye view of modern index shifting design, a trouble shooting guide, and a 'glossary' to steer you through the SRAM products nomenclature.

What hasn't changed is our commitment to keeping things simple and effective, not to mention serviceable. SRAM products are designed to be conventionally maintainable , with as little cost and inconvenience as possible. Please contact us or your local dealer/distributor for further information regarding system and spare parts availability.

WARRANTY

SRAM Corporation will warranty any Grip Shift system, unit or part for up to two years from the date of purchase, that is found by the manufacturer or its authorized agents to be defective in materials and/or workmanship.

The ESP Derailleur System and the Bassworm carry are warranted against defects in materials and workmanship for up to one year from the date of purchase as found by SRAM Corporation or its authorized agents.

Replacement or repair will be executed at the option of SRAM Corporation. Breakage or damage that occurs as the result of misuse and/or abuse is not covered under warranty. Alterations or modifications of any SRAM components by the user, render the warranty null and void.

Normal wear of rubber grip covers and stationary grips will not be covered under warranty. These parts are covered for manufacturing defects only.

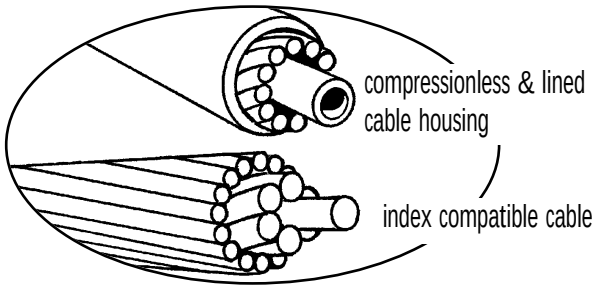
TABLE OF CONTENTS

INDEX SHIFTING

Efficiently shifting chain from sprocket to sprocket in modern indexing systems essentially relies on how effectively the drive train components can bend/change chain angle under load, with minimal effort by the operator to allow the destination cog(s) or chainring(s) to smoothely pick-up the chain; i.e. complete the gear shift.

Component compatibility and proper set-up is necessary for any precision shifting system:

- low friction/accurately tensioned cable system connections between shifter and derailleur
- component compatibility and orientation: such as matching rear cog set cluster to rear derailleur shifting geometry, and matching the crank/chainring spatial relationship to the front derailleur shifting geometry
- combining efficient chains with their compatible cogsets,chainring, etc; with a consideration for the wear and tear or useable lifespan of these parts.



CABLE & HOUSING

Indexing systems feature the clicks, or detents, in the shifter not the derailleur. A reliable relationship between a shifter detent (click) and the accurate response from the derailleur, relies on a precise cable connection in between. In this context, precise means rigid and slippery. Rigid because we want the derailleur to land in the same position relative to the cog set/chainring regardless of whether we got to that sprocket by pulling (compressing housing/stretching inner wire) cable or by releasing (decompressing housing). Slippery because most of the work of shifting a is actually expended overcoming friction in the cable. Especially so, because fractional drag in the cable is proportional to the tension of the cable. Therefore flexible, smooth surfacing and corrosion resistant qualities of a derailleur cable is vital to low effort index shifting.

Further, index linkages require properly sized, lined and capped compression less housing (compressionless as made rigid by small wires oriented primarily parallel with a slight helical rap), not flat coiled cable housing (soft/bendable).

REAR SHIFTING / DERAILLEUR

Vital to rear indexing is an efficient (consistent & small *) gap between the guide (top) pulley and the cog set,at any given rear cog. Shifting, or flexing a shorter length of a chain between these points, in order for it to catch its destination cog, requires less effort (or overshift) from the derailleur/shifter. The qualities necessary for efficient rear indexing and chain gap control are:

- cogset specific b-tension screw adjustment
- chain compatibility, side-play ridgidity and length
- derailleur total capacity/pulley cage size
- derailleur dropout hanger alignment and location with respect to maintaining correct actuation geometry
- low friction and precise moving linkages & pulleys of the derailleur: lubrication and wear and tear affect this primarily.

INDEX SHIFTING

* Too small is a problem as the chain will not be able to get out of its own way to make the transition to the next cog; pulley chatter shifting into the largest cogs is characteristic.

FRONT SHIFTING / DERAILLEUR

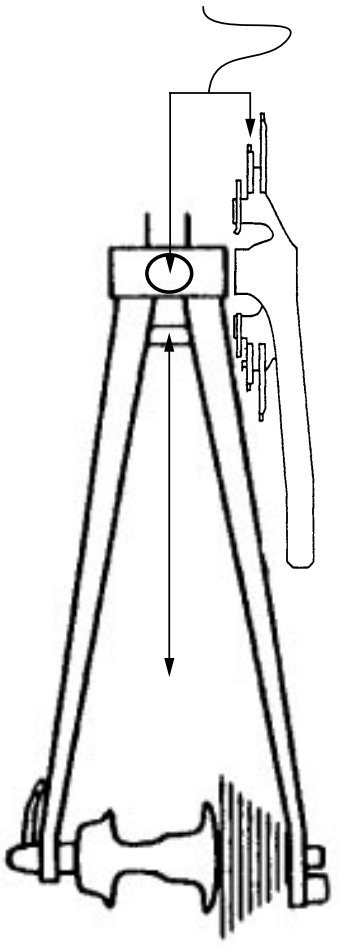
Vital to front shifting (index and friction) is the combination of the following factors:

- •chain line (see figure to right)
- •accurate derailleur cage positioning
- •compact and standard sizing derailleur cage/chain wheel compatibility
- •adherence to total capacity and max./min. chain ring teeth tolerances of the front derailleur and drive train
- •Front indexing (Shimano™ Dual SIS®) relies on strict adherence to these factors in addition to a spe cific difference in chainring to chainring spacing from conventional, evenly, spaced cranks. This is linked to the system design intention: "light action" and precise front derailleur index control.

COGS, CHAINS, & CHAINRINGS

A final and major factor of quality indexing is the physical interaction between the chain and cog/chainring during shifting. The use of both gated ramps on the cog /chainring face and a strong narrow chains with flared inner and outer plates, provides for a more efficient chain pick up/release under load by the destination cog/chainring. :"Efficient" meaning a lesser angle/over shift is required of the derailleur to change gears. The transition the chain makes is smoother, especially under load. Proper lubrication and cleanliness of these components is vital to optimal drivetrain operation and dramatically affect system wear and tear.

**Chainline* measurement:
center of seat tube to
center of middle chainring
in millimeters. Generally 47.5mm to 50 mm is desireable.**

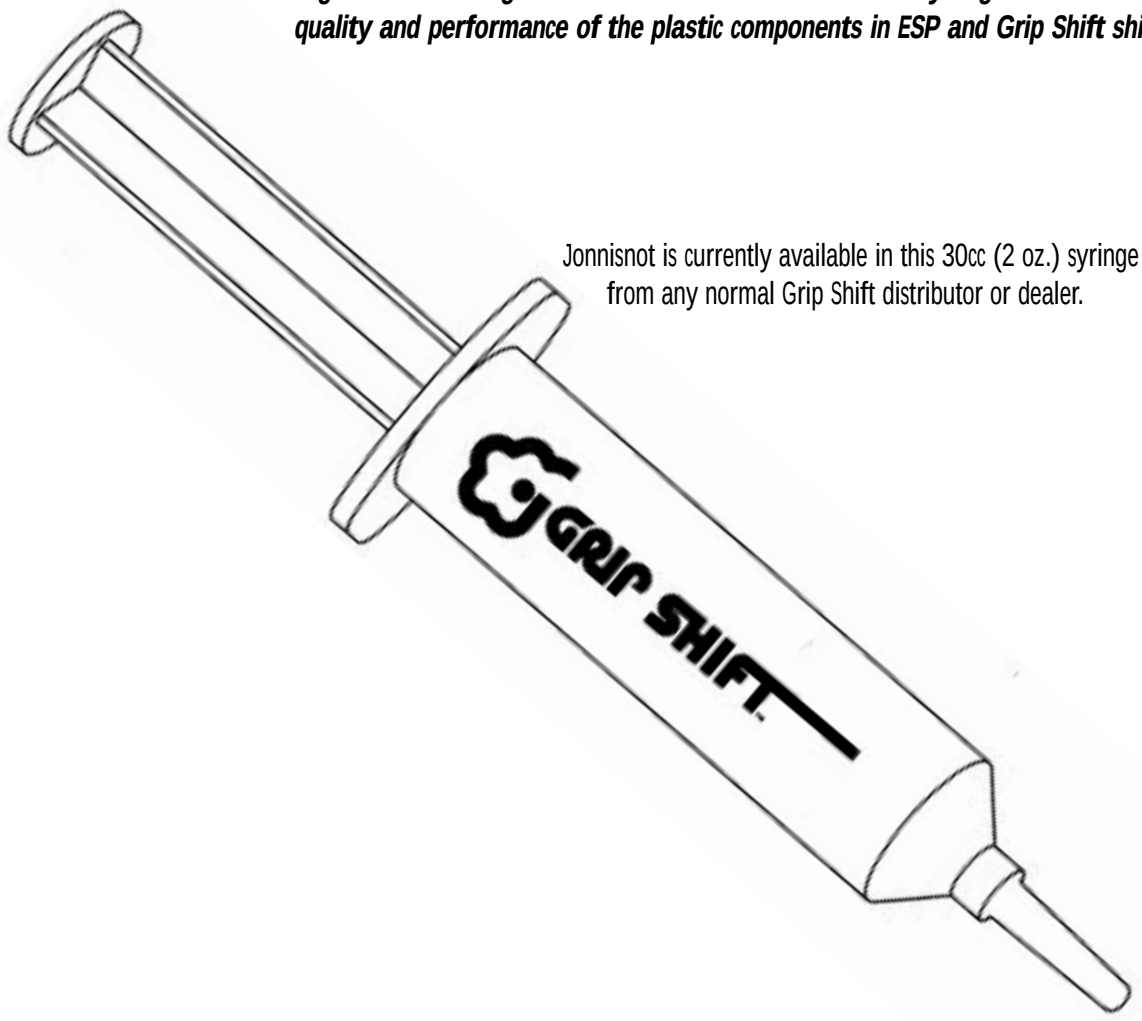


* note: use metric vernier calipers for a preciscion measurement

JONNISNOT

Jonnisnot is the factory installed lubricant in all Grip Shift and ESP shifters. We've developed Jonnisnot specifically for reducing friction in the plastic to plastic and metal to plastic interfaces of our shifters. Additionally it is ideal to some parts of our ESP rear derailleur (see ESP Derailleur Maintainence). Jonnisnot and the Finish Line™ brand "Grip Shift Approved Grease" are the only lubricants we currently recommended for use in Grip Shift and ESP shifters.

Warning: Use of other greases or lubricants will considerably degrade the material quality and performance of the plastic components in ESP and Grip Shift shifters



Jonnisnot is currently available in this 30cc (2 oz.) syringe from any normal Grip Shift distributor or dealer.

CLEANING AND LUBRICATION

We recommend that cleaning and lubrication of ESP and Grip Shift shifters should be initiated only when the shifter interior has become excessively contaminated and shifting performance deteriorates as a result: in our experience it is contamination of the cable and housing system that causes high friction build up in a shifting system and this should be examined first.

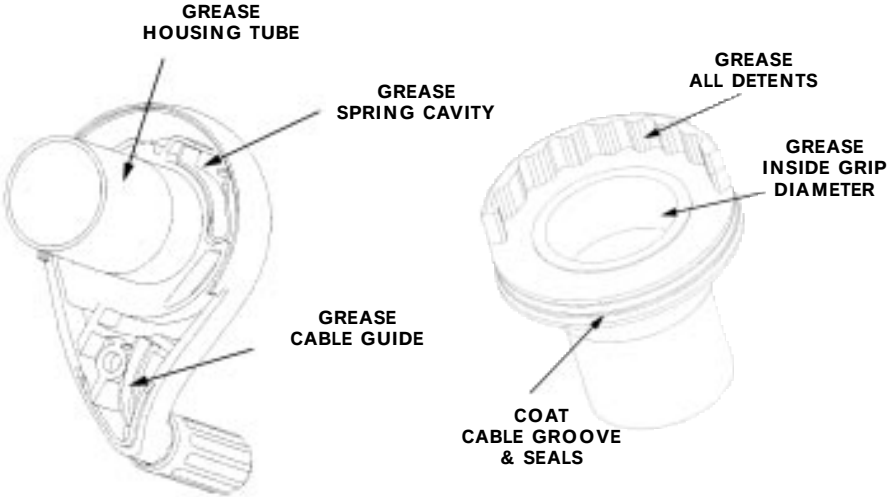
(Please see page 28-31 for information concerning cleaning of ESP derailleurs.)

Caution: Your bicycle is not on fire...

Clean your bicycle like a professional and avoid the excessive wear and tear to your components caused by spray/power washing dirty components. The professional race mechanic washes bikes for racers that rely on component precision. The pro method requires lo-tech materials, a little care and galoshes: gently work the mud off with a large soapy sponge and bottle brush out of a bucket of warm soapy water; then rinse with a clean water sponge bath . Be sure to simply lean the bike on both its wheels or clamp it into a bikestand to do the work: avoid the "sacrificial" race-site amateur ritual of hanging the bike vertically or upside down to hose it clean as this leads to dirty water drainage into now vulnerable components. Above all, avoid "quick" rinses at the car wash, even spraying with a nozzled garden hose, as this will directly push contaminants past the "sealed" mechanisms of your bike and severely compromise their performance and lifespan.

The best way to clean a Grip Shift shifter is to wipe out debris from the interior with a cotton swab. If the shifter is thoroughly contaminated it should be removed from the handlebar, dismantled and washed with a small brush in a mild dish soap and water solution. All shifter parts should then be rinsed in clean water, let air dry and relubricated as shown below. Use only Grip Shift Jonnisnot brand grease (plastics specific), or Finish Line "Grip Shift Approved" grease: be careful not to use degreasers that may bloat, soften or otherwise damage plastics.

- lightly grease all detents
- lightly coat inside grip diameter
- wipe a small amount of grease all around the inboard seal
- lightly grease housing tube
- lightly grease spring cavity
- lightly grese cable guide



TROUBLE SHOOTING

Excessive effort required to twist shifter. Check for...

•high friction in cable and housing caused by dirty or cracked cable housing. Check that the housing is capped and compressionless. Check if installed in too short lengths or routed inefficiently: small bends, kinks and sharp braze-on angles add friction

•wrong (regular bearing) grease/lubricant or degreaer used inside shifter

•dirt has penetraded past shifter seals

•no washer(s) between the shifter and stationary grip

•handlebar diameter too small for our clamp (.875 inch +/-.01) is forcing clamp to deform shifter housing

•shifter cable clamped to wrong side of derailleur binder bolt: loss/change of mechanical advantage

•shifter spring facing the wrong direction or deformed shifter housing spring cavity.

Inaccurate rear indexing. Check for...

•inconsistent spec in drivetrain components (incompat ible or worn chain, pulleys)

•high friction in cable and housing slowing rear derailleur response to shifter command: delayed parallelogram spring back during chain up-shifts

•inaccurate B-tension screw adjustment

•drop-out hanger alignment

•"d" dimension off: cog set spaced too far or too close for derailleur actuation geometry .Outboard face of small cog to outboard face of hanger drop-out must = .5 inches/12.75mm (see page 27)

•inconsistent spacing in the cog set (see page 27)
8 speed HG = .48 cm (.190 inches) cog center to cog center; corresponding spacers are 3.0mm
7 speed HG = .50 cm.(.197 inch); corresponding spacers are 3.15mm

•worn or contaminated paralellogram, "P-pivot" or "B-pivot" springs or assemblies (see SRAM glossary next page)

Inaccurate front shifting. Check for...

•chain line measurement, i.e. chain wheel placement exceeds front derailleur/shifter capacity(see page 7)

•derailleur alignment/positioning and limiter settings

Note: do not rely on the derailleur limiters for proof of insufficient cable pull by a shifter as these can allow for cage actuation beyond shifter and system design capability.

•inconsistent spec in components *

a) chainring sizes could be inconsistent with c-ring to c-ring tooth difference or front derailleur totalcapacitycompact vs. non compact drive

b) inconsistent chain to chainring interface due to incompatibility or wear and tear

•shifter cable bound to incorrect side of derailleur binder bolt.

* when matching our Grip Shift and ESP *FFS* (short rotation) front shifters with older model front derailleurs (generally pre-1994), the level of torque required to twist the shifter may seem high due to the higher spring forces of these earlier derailleurs.

SRAM GLOSSARY

B-knuckle:
the major aft, rear derailleur body part that anchors the parallelogram link plates and contains the frame hanger bolt and limiter screws

Bassworm:
frictionless seal designed to shield rear derailleur housing from contamination (seal moves with rear shifter cable during actuation). Also features an elastic body that can be pre-loaded to help boost cable tension/rear derailleur response to shifter commands.

Compressionless housing:
recommended index shifting specific cable housing, stiff structure is characterized by small continuous wires wound in a helical fashion to bend uniformly. Available in lined 3.6mm, 4mm, & 5mm outer diameter sizing (SRAM SS cables will work with all three).

Derailleur cable:
1.1 or 1.2 outer diameter wound steel cable. Available in smooth or die drawn finishes. Wound from stainless (corrosion resistant/costlier), zinc coated, or ordinary carbon steel wires (least expensive/less efficient). Available with teflon or plasticized coatings for added lubricity under tension (as part of a cable system design)

SRAM SS cables:
ultra flexible stainless steel 1.1mm diameter index shifter cable that also has a smooth/low friction exterior. These cables are factory specified in the ESP 900 & 700, SRT 800 X-RAY & SRT 600 shifter systems. They are available as after market replacement cables. Compatible with 5mm, 4mm & 3.6mm compression less cable housing.

ESP:
SRAM rear shifter/derailleur operating system featuring a unique 1:1 shifter to derailleur actuation ratio. ESP rear shifters are set apart from normal Grip Shift shifters as they utilize twice as much cable to move the rear derailleur as normal shifters. Extra Sensory Perception...what else?

FFS:
Fastest Front Shifting. 3 chainring shift rotation reduced from 140˚ to 70˚. Found on the following model (Available in both friction front and index front grips):

•ESP 900,700 & 500
•SRT 800 X-RAY, SRT 600, SRT 450, SRT 400
•MRX 170

Friction grip:
multiple detent position front shifter, twist grip, designed for fine tune "trim" adjustment of the front derailleur cage.

Grip:
portion of Grip Shift shifter assembly that the rider twists in order to shift gears. Made of hard plastic the grip is covered by a "rubber" grip cover. Contains indexing detents and seals.

Grip cover:
replaceable textured "rubber" sleeve mounted on the grip that the rider's hand contacts.

Guide Pulley:
the upper or top pulley of a rear derailleur; guides the chain from cog to cog as commanded by the shifter.

Housing:
major portion of shifter assembly that the grip slides into. contains replaceable press fit handlebar clamp & bolt, cable barrel adjuster, index spring and cable guide noodle.

Index grip:
Dual SIS® compatible three detent position front shifter grip, available for all ESP and Grip Shift SRT, MRX and Quick Shift systems.

Index Spring:
Stainless steel shifter detent spring located in the housing interior cavity. Note: this spring is unidirectional. See page 17 for proper installation.

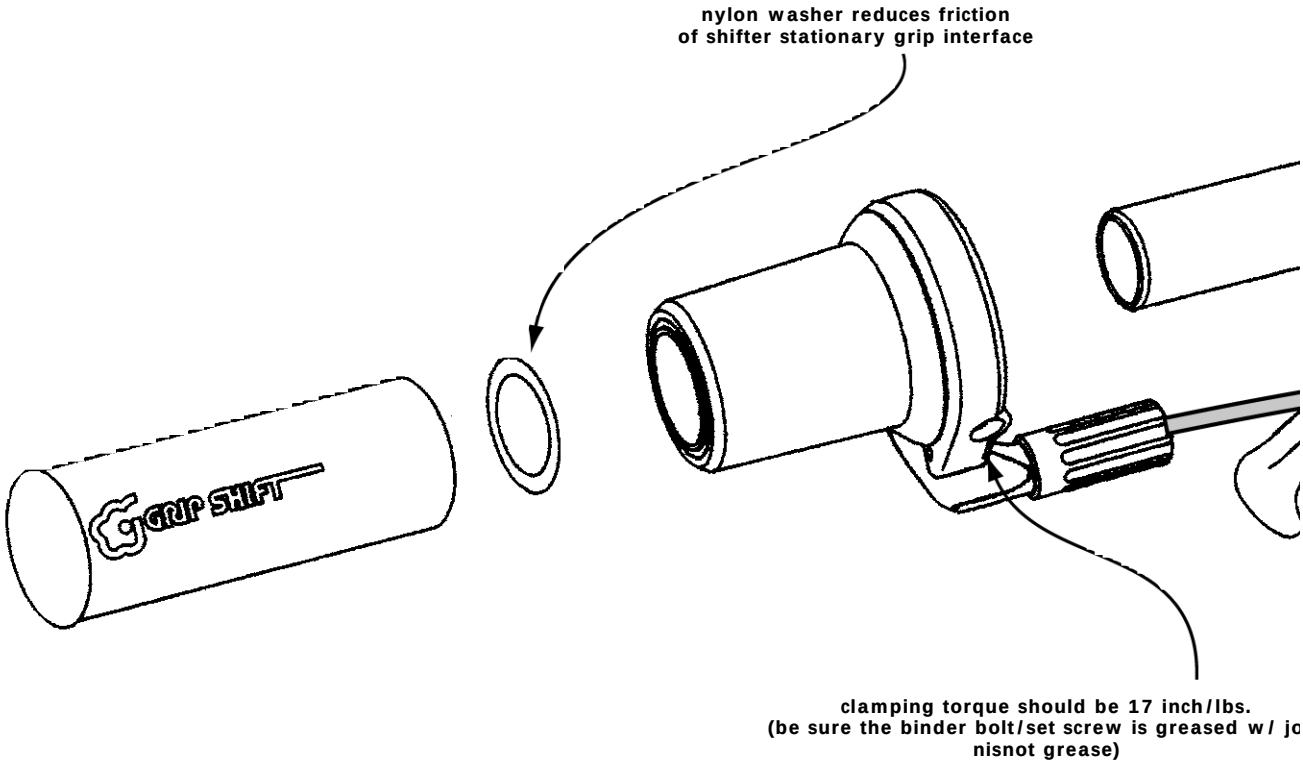
Noodle:
replaceable low friction cable guide found in the left and right housing assemblies of the following systems: ESP 900 & 700, SRT 800 X-RAY & SRT 600.

P-knuckle:
the major forward rear derailleur body part; anchors the parallelogram link plates and houses the pulley cage pivot spring assembly.

SRAM:
once known as a misspelled ubiquitous breakfast sausage...now its not just for breakfast anymore; a.k.a. FRAM, SCRAM, SERAM, CERAM ...don't worry the mail still gets to our address.

SRT:
Size, Rotation & Transition; the design goals we had for re-inventing our original straight handlebar, Grip Shift twist shifters.

SHIFTER INSTALLATION

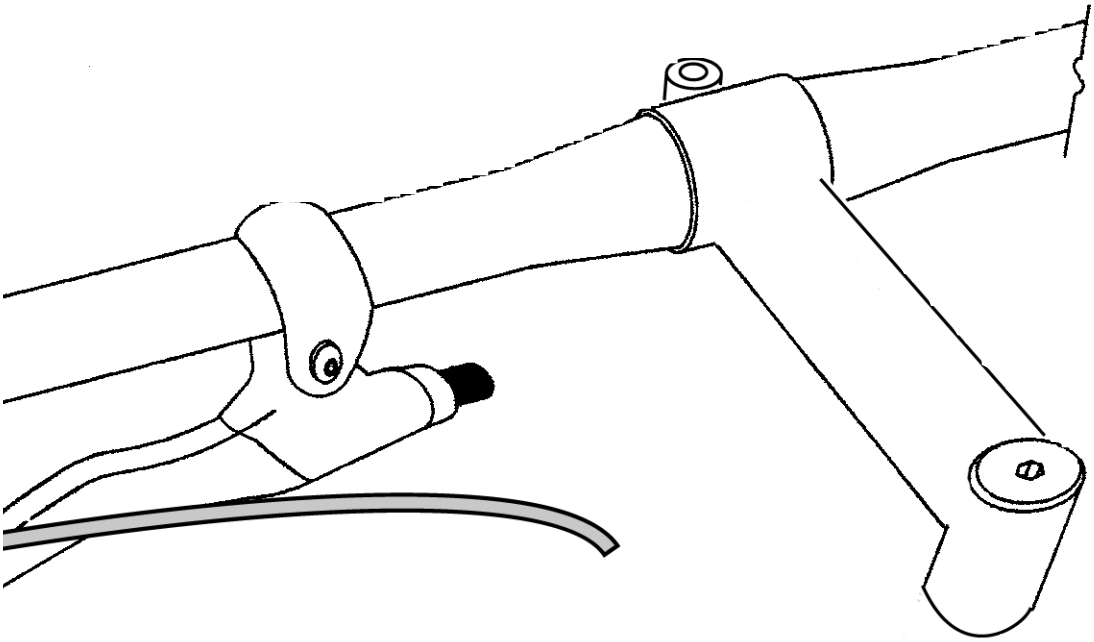


❶ Slide the shifter onto the end of the handle bar leaving adequate room for the stationary grip (and handlebar extensions). If necessary, move the brake lever to accommodate correct positioning*.

❷ Position shifter so that the derailleur cable exists beneath the brake lever (note: leave enough room for complete brake lever stroke). Fasten shifter and brake lever to handlebar (tightening torque for shifter 3mm hex bolt is 17 in/lbs or 20 kfg/cm).

* For SRT 450, correctly position shifter/brake lever assemblies into place on handlebar, leaving enough room for stationary grips (and handlebar extensions) and fasten to above torque rating. Then secure the front and rear brake cable end buttons into their respective brake levers. Thread the brake cables through their housings and braze-ons. Adjust and fasten the cables to their respective brakes per the brake manufacturer instructions.

SHIFTER INSTALLATION



❸ Thread the derailleur cable through its compressionless housing lengths (use new & properly measured and capped cable housing) and frame stops, and fasten to the derailleur. Adjust cable tension for accurate shifting

❹ Slide the plastic 7/8" washer and then the stationary grip onto the handlebar. Do not use solvents, lubricants or hair spray to install grips: they will damage the grip rubber & possibly the shifter.

❺ Actuate the brake levers and shifters to be certain of proper placement & installation before test riding.

CABLE CHANGE VIEWS

SRT 800, 600, 450 & 400 rear; MRX 100 front & rear; Quick Shift front & rear

(note : for best results do not remove the shifters from the handle-bar. Use only new and high quality cable, and compression-less housing!)

1. Release shifter cable from the derailleur binder bolt (front or rear).

2. Twist shifter back, into the full cable pull position, as if you were shifting to large chainring or largest rear sprocket.

   e.g.: for rear shifter align the "1" with the white gear indication mark; for front align the "3" with the mark

3. Loosen, but don't remove, the shifter and brake lever clamps (and move stationary grip outboard) to open a gap of 1-2 inches between the shifter and stationary grip.

4. For MRX and Quick Shift models open by pulling the shifter Grip away from the shifter Housing: be sure not to twist the shifter. For other shifters, first remove the seperate cable retention cover: models 800 & 600 use a phillips head screw driver; 400 requires a flat head screw driver (see figure 4.a)

   Note: the index spring may dislodge from its cavity in the shifter Housing during disassembly: be sure to replace it in the correct direction. (See figure 4.b, or page 17.)

   Remove the shifter cable. Be sure not to drag contamination into the shifter interior during removal. TIP: if discarding old cable, sever the cable at the shifter barrel adjuster before unthreading from the shifter.

   Note: If shifter is contaminated, clean and lube before re-installation (see page 9)

5. Re-route cable as shown, with Grip oriented into the fully cable released position

6. e.g.: for rear shifter align the "7" with the white gear indication mark (see figure 6); for front align the "1" with the mark

7. MRX & QS: while pulling on cable and with the index spring correctly positioned, push and re-snap the Grip into the Housing body as shown.

7. SRT shifters: close shifters as above and replace the cable retention covers. Be careful not to pinch the inboard seals of 800 & 600 models during cover re-install.

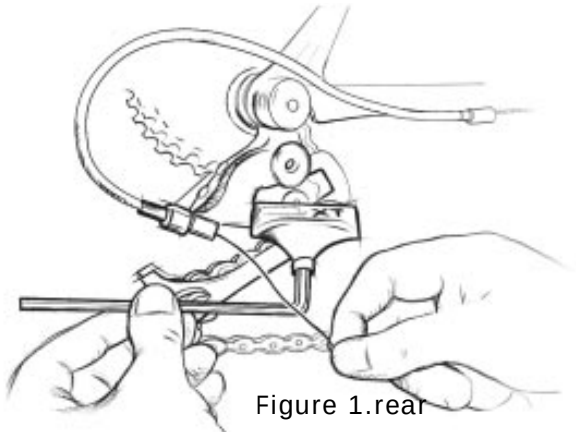


Figure 1.rear

Figure1. front

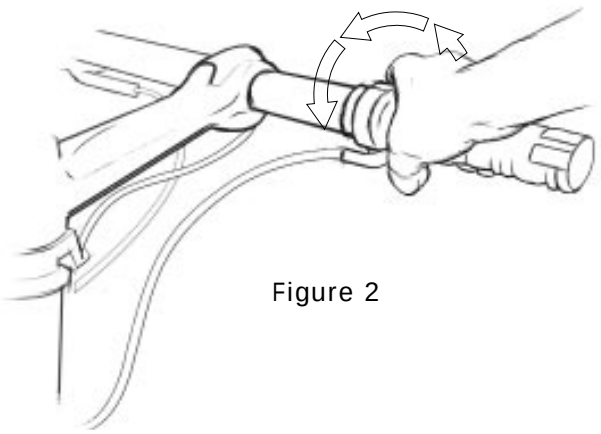


Figure 2

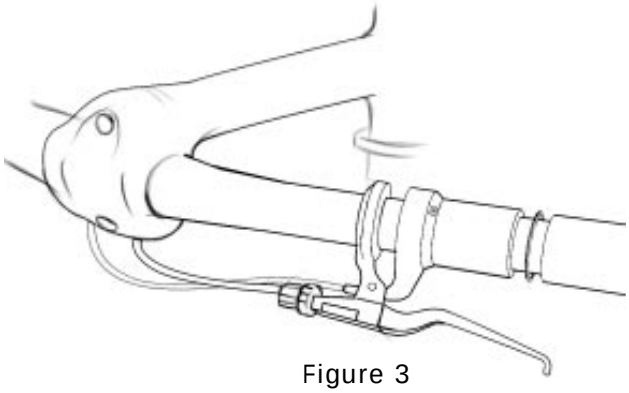


Figure 3

CABLE CHANGE VIEWS

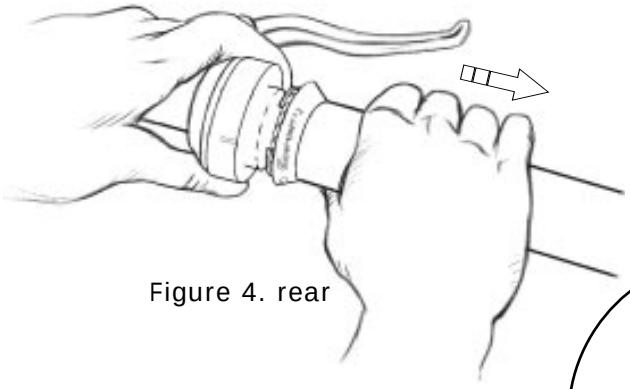


Figure 4. rear

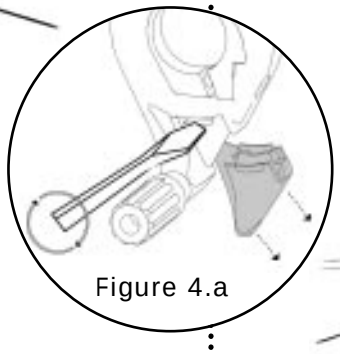


Figure 4.a

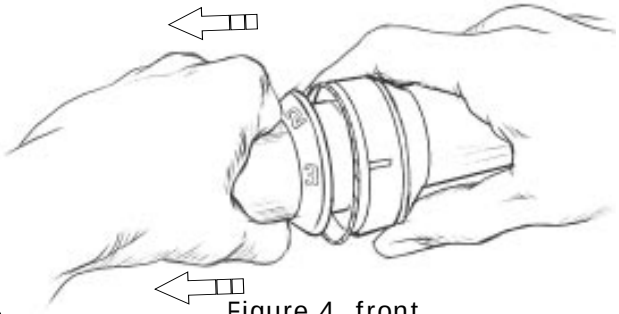


Figure 4. front

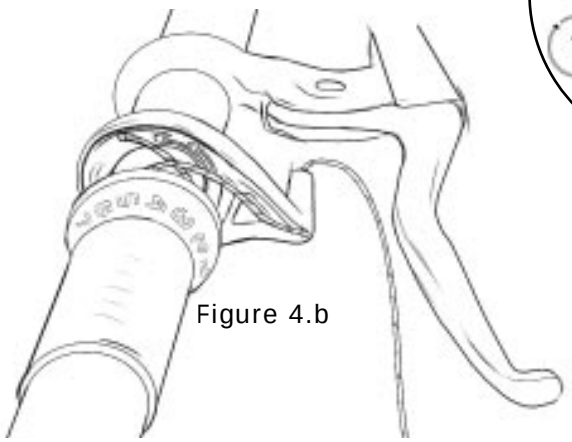


Figure 4.b

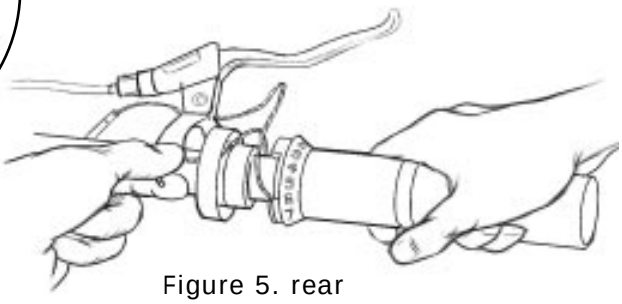


Figure 5. rear

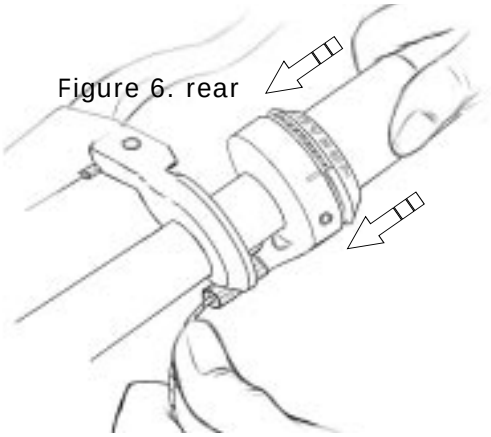


Figure 6. rear

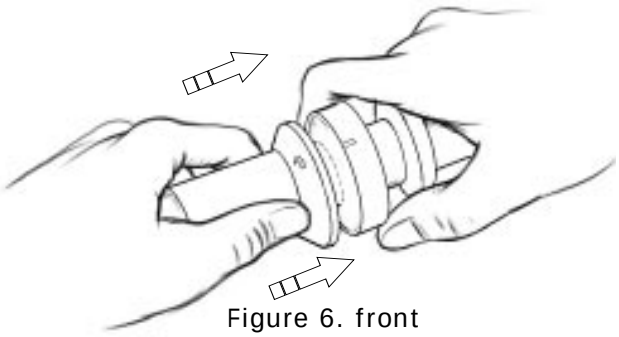


Figure 6. front

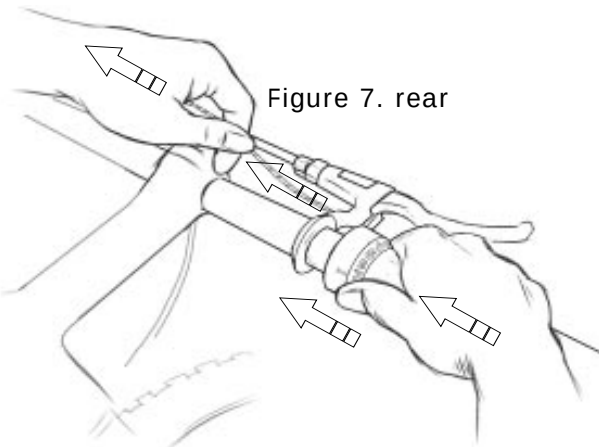


Figure 7. rear

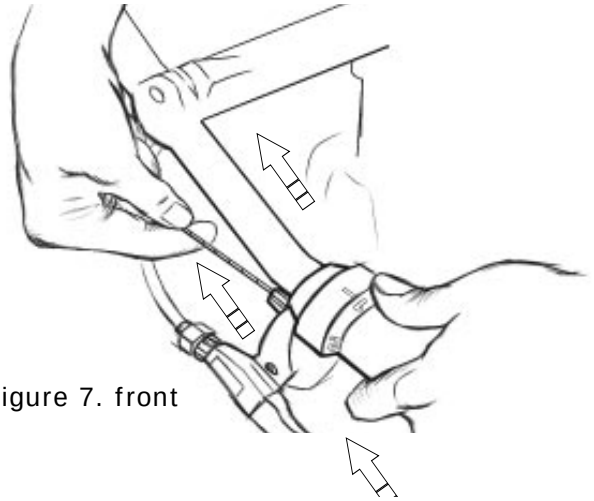


Figure 7. front

CABLE CHANGE VIEWS

ESP 900, 700 & 500 Front and Rear; SRT 400 IH; MRX 170 IH; SRT 400, 450, 600 & 800 FFS Front; MRX 170 Front

❶ Rotate shifter grip so that chain positions onto smallest cog or chainring. Detach the cable from derailleur.

❷ Slide the stationary handlebar grip away from the shifter.

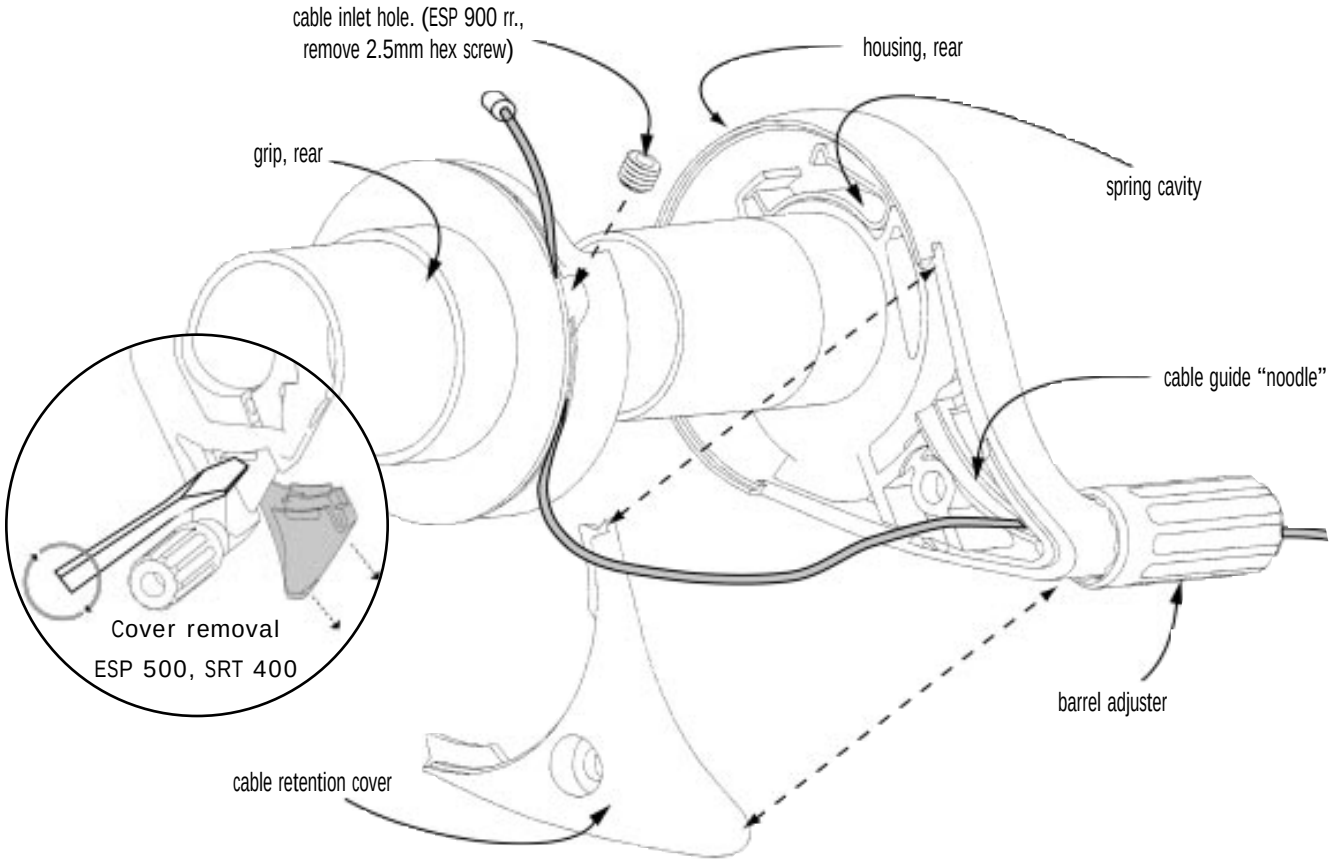
❸ Remove the cable retention cover (see illustrations). Open the shifter by sliding the Grip away from the shifter Housing body (the index spring may become dislodged from its cavity, in the process).

❹ For ESP 900 rear model, remove the cable head retention screw from the cable inlet hole using a 2.5mm hex wrench.

Remove & discard the old cable. Be sure to wipe the cable clean of debris before pulling it through the shifter (if shifter is contaminated, clean and relubricate properly before reassembling: see "Clean & Lube").

❺ Install the new derailleur cable. Make sure the cable end-button is seated securely in the shifter

Rear Shifter View



CABLE CHANGE VIEWS

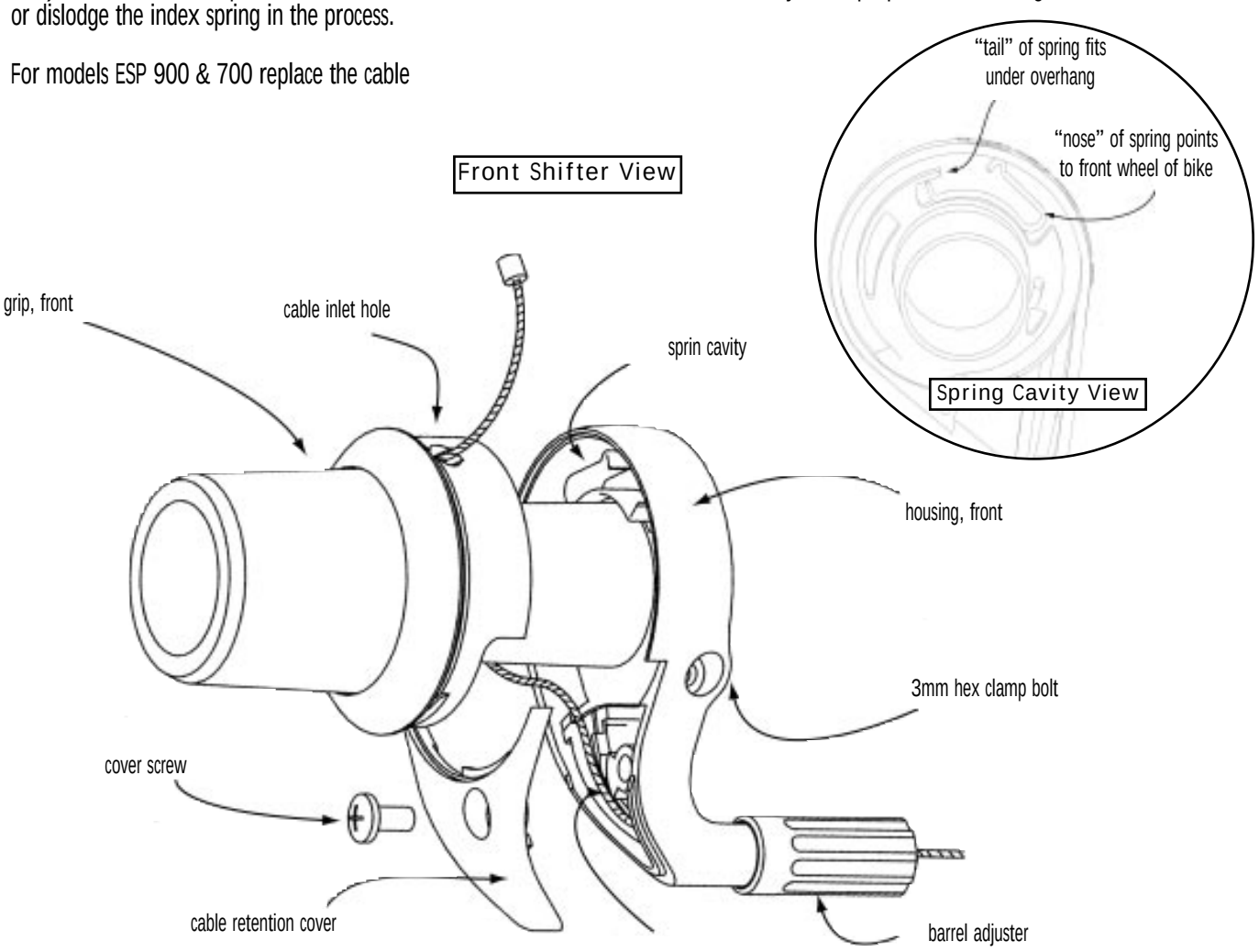
GRIP (for ESP 900 rear, be sure to replace the cable button retention screw). Thread the cable through the shifter HOUSING and out of the barrel adjuster.

❻ Close shifter assembly by sliding the shifter GRIP back into the shifter HOUSING body, at the maximum cable release position (make sure the metal index spring is correctly seated in its cavity and that it slides into one of the GRIP detents). For Model MRX 170, snap the shifter back together now). Be careful not to pinch the derailleur cable or dislodge the index spring in the process.

❼ For models ESP 900 & 700 replace the cable retention cover plate and screw (be careful not to pinch the inboard seal or cable). For models ESP 500 and SRT 400 IH, snap the cable retention cover back in place.

❽ Check for proper assembly by rotating shifter grip and listening for clicks.

❽ Thread the shifter barrel adjuster nut all the way in and back it off one half turn. Route the cable through the cable housing & frame; fasten to derailleur. Adjust for proper index shifting.



GRIP SHIFT REPLACEMENT PARTS

Assembly No.	MRX 170-11 &-12	MRX 170-32	MRX 170-51
Grip	200-266, 200-267	200-266	200-269
Housing	200-253	200-268	200-255
Adjuster Nut	500-506	500-506	500-506
Spring	600-102	600-102	600-103
Shifter Cover	500-131	500-131	500-131
Cable	200-337	200-337	200-337
Clamping Collar	600-104	600-104	600-104
Set Screw	600-304-1	600-304-1	600-304-1

Assembly No.	SRT 400-11	SRT 400-32	SRT 400-71	SRT 400-81
Grip	200-235	200-236	200-237	200-272
Housing	200-210	200-210	200-209	200-209
Spring	600-401	600-401	600-401	600-401
Cover	500-407	500-407	500-406	500-406
Adjuster Nut	500-613	500-613	500-613	500-613
Shifter Cover	500-411	500-411	500-411	500-411
Cable	200-337	200-337	200-337	200-337
Clamping Collar	600-601	600-601	600-501	600-501
Bolt	600-502	600-502	600-502	600-502

Assembly No.	SRT 600-11	SRT 600-32	SRT 600-71	SRT 600-81	ESP 700-11	ESP 700-32
Grip	200-242	200-243	200-244	200-245	200-277	200-278
Housing	200-212	200-212	200-211	200-211	200-262	200-262
Spring	600-401	600-401	600-401	600-401	600-401	600-401
Cable	200-337	200-337	200-337	200-337	200-337	200-337
Cover	500-607	500-607	500-505	500-505	500-607	500-607
Shifter Cover	500-612	500-612	500-612	500-612	500-710	500-710
Adjuster Nut	500-613	500-613	500-613	500-613	500-613	500-613
Noodle	500-609	500-609	500-507	500-507	500-609	500-609
Washer	500-508	500-508	500-508	500-508	500-508	500-508
Clamping Collar	600-601	600-601	600-501	600-501	600-601	600-601
Bolt	600-502	600-502	600-502	600-502	600-502	600-502
Cover Screw	600-503	600-503	600-503	600-503	600-503	600-503
Bolt insert						
Set Screw (cable head)						
Seal (out board)						
Insert	600-504	600-504	600-504	600-504	600-504	600-504

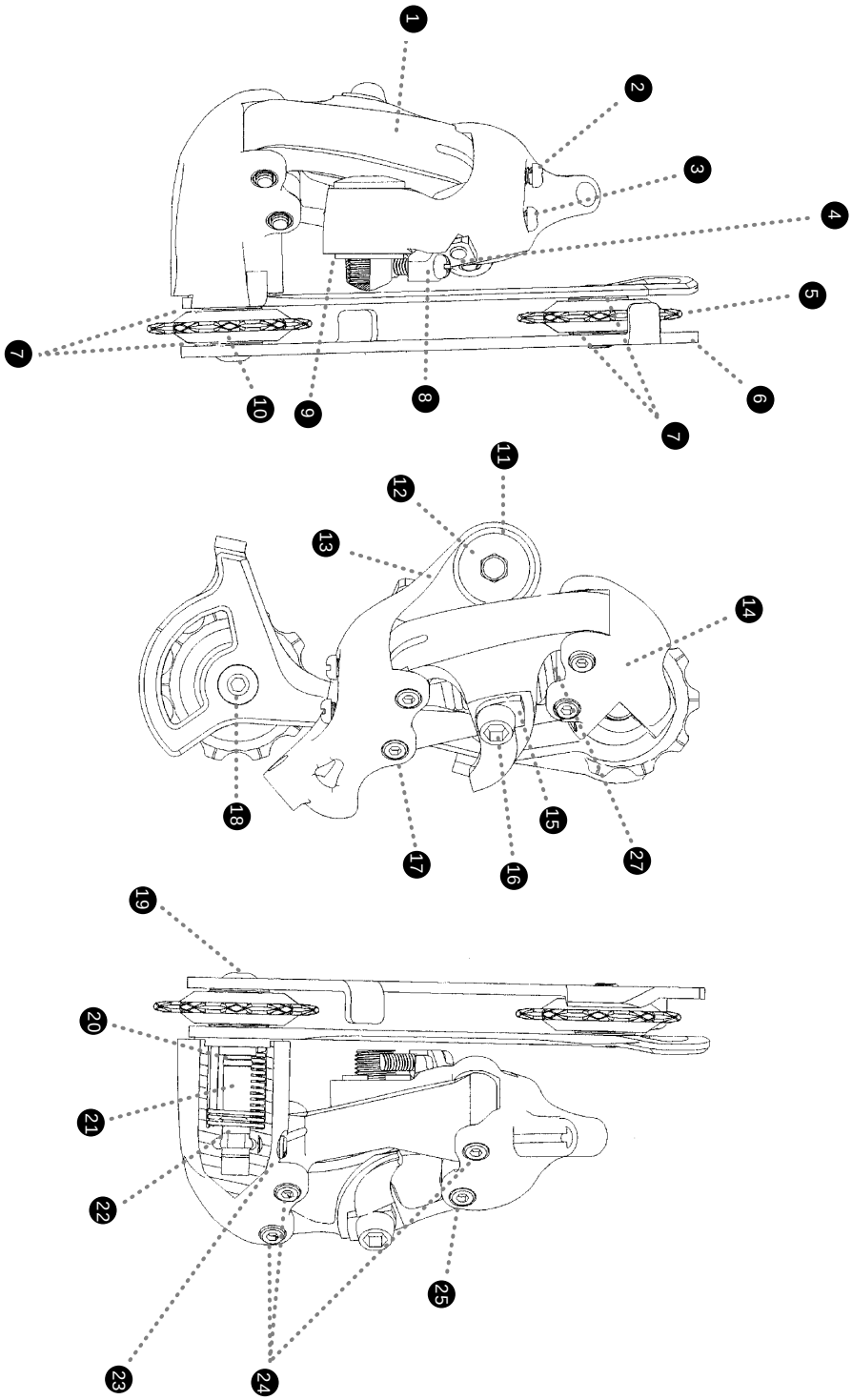
GRIP SHIFT REPLACEMENT PARTS

MRX 170-71	MRX 170-61	MRX 170-41(IH)	
200-270	200-271	500-127	**Grip**
200-255	200-255	500-126	**Housing**
500-506	500-506	500-506	**Adjuster Nut**
600-102	600-102	600-102	**Spring**
500-131	500-131	500-131	**Shifter Cover**
200-337	200-337	200-337	**Cable**
600-104	600-104	600-104	**Clamping Collar**
600-304-1	600-304-1	600-304-1	**Set Screw**

SRT 400-73 & 41(IH)	ESP 500-11	ESP 500-32	ESP 500-71	ESP 500-81
500-409-3	200-273	200-274	200-275	200-276
500-408	200-258	200-258	200-259	200-259
600-401	600-401	600-401	600-401	600-401
500-406	500-407	500-407	500-406	500-406
500-613	500-613	500-613	500-912	500-912
500-413	500-522	500-522	500-522	500-522
200-337	200-337	200-337	200-337	200-337
600-501	600-601	600-601	600-501	600-501
600-502	600-502	600-502	600-502	600-502

ESP 700-81	SRT 800-11	SRT 800-32	SRT 800-81	ESP 900-11	ESP 900-32	ESP 900-81
200-279	200-246	200-247	200-248	200-249	200-250	200-216
200-264	200-214	200-214	200-213	200-215	200-215	200-251
600-401	600-401	600-401	600-401	600-401	600-401	600-401
200-337	200-337	200-337	200-337	200-337	200-337	200-337
500-706	500-807	500-807	500-806	500-807	500-807	500-906
500-710	500-812	500-812	500-812	500-910	500-910	500-910
500-912	500-613	500-613	500-613	500-613	500-613	500-912
500-908	500-609	500-609	500-507	500-609	500-609	500-908
500-508	500-508	500-508	500-508	500-508	500-508	500-508
600-501	600-601	600-601	600-501	600-601	600-601	600-501
600-502	600-502	600-502	600-502	600-502	600-502	600-502
600-503	600-503	600-503	600-503	600-503	600-503	600-503
	600-801	600-801	600-801	600-801	600-801	600-801
600-901						600-901
	500-808	500-808	500-808	500-808	500-808	500-808
600-504	600-504	600-504	600-504	600-504	600-504	600-504

ESP DERAILLEUR PARTS DESCRIPTION



ESP DERAILLEUR PARTS DESCRIPTION

parts description — replacement parts

	DESCRIPTION	QTY	ESP 9.0	ESP 7.0	ESP 5.0
1	outer link	1	•		
2	high limit screw	1	•	•	•
3	low limit screw	1	•	•	•
4	b-adjust screw	1	•	•	•
5	idler pulley	1	•	•	•
6	inner cage plate	1	•	•	•
7	pulley spacers	4	•	•	•
8	b-bone	1	•		
9	b-nut	1	•	•	•
10	guide pulley	1	•	•	
11	wave washer	1	•	•	
12	hanger bolt	1	•	•	
13	b-knuckle	1	•		
14	p-knuckle	1	•		
15	cable washer	1	•	•	•
16	cable anchor bolt	1	•	•	•*
17	o-ring (2/ea pin)	8	•		
18	idler pulley bolt	1	•	•	•
19	guide pulley bolt	1	•	•	•
20	o-ring (p-shaft)	1	•	•	•
21	p-shaft	1	•	•	•
23	p-spring	1	•	•	•
24	p-shaft retention screw	1	•	•	•
25	short pivot axle bolts	3	•		
26	long pivot axle bolt	1	•		
27	parallelogram spring	1	•		

**ESP 5.0 features a cable anchor nut and fixing bolt*

ESP DERAILLEUR INSTALL

❶ *Installation of rear derailleur*

The ESP attaches to the frame via a 6mm hex head hanger bolt. Be sure when installing that the bolt threads are lightly coated with grease or some form of anti-seize compound, to ease installation and prevent corrosion. Installation torque should not exceed 70-85 inch/lbs. Also, make sure that the B-adjustment screw clears the drop out tab during tightening of the hanger bolt.

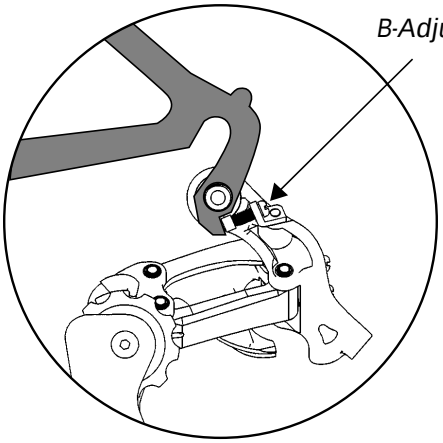


Figure 1

❷ *Chain length*

Bypassing both derailleurs, stretch the chain over the largest rear cog and front chainring and add one section (link). See figure 2 . This measurement insures that the drivetrain is not overextended in the unwanted event of a large chainring/largest cog shift.

***Note**: when measuring chain for an active rear suspension bicycel frame, be sure to account for extra extension in the drivetrain during activation: follow the "one section" rule for measuring chain length when the frame set/suspension is in its fully articulated position.*

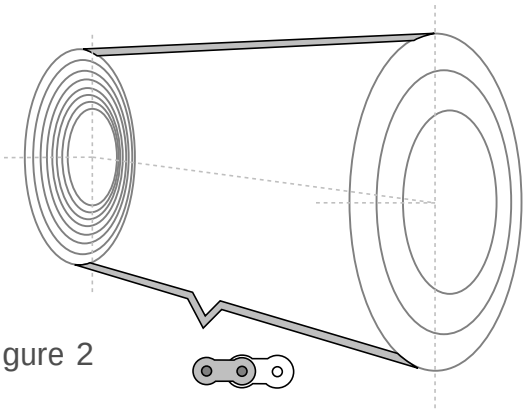


Figure 2

Add one section of chain

❸ *Bottom and top limit adjustment*

With the derailleur installed onto a correctly aligned dropout*; view from behind and align the top (guide) pulley wheel vertically with the smallest rear cog. Use the bottom adjustment screw (H) to fine tune this alignment. Next, by hand move the derailleur inboard. Using the top adjustment screw (L), align the guide pulley with the largest/most inboard cog.

**A misaligned dropout will result in poor index shifting/chain chatter: outboard side impacts most commonly affect bent frame hangers. It is necessary to use a proffesional re-alignment tool in this event. Do not "eye" this adjustment or leverage the derailleur in an effort to fix this by hand!*
(See page 27)

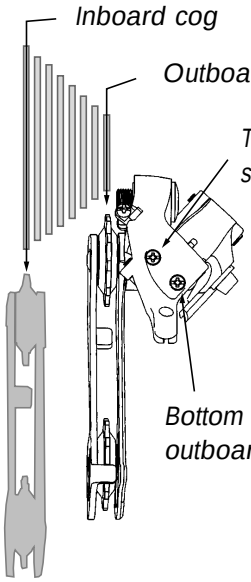


Figure 3

ESP DERAILLEUR INSTALL

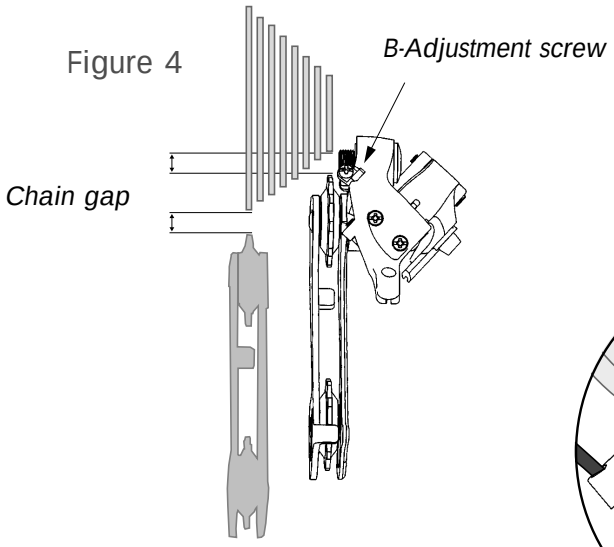
❹ *B-adjustment & chain gap*

Correct setting of the b-adjustment screw on the back of the derailleur tailors it to different sized cogsets, and balance two functions vital to crisp index shifting:

1) Tuning adjustment of the "B" screw to allow enough shift clearance for the chain to move to-and-from the largest rear cog (28,30, or 32 tooth)

2) Maintaining good chain gap: quick, crisp shifts are the result of smaller, more efficient lengths of chain between the guide pulley and the destination cog (especially at the smallest cogs).

Figure 4



❺ *Indexing shifting adjustment*

Note: *Perform the following adjustment only after the limiter adjustments, the B-adjustment, and derailleur alignment are correctly set.*

Rotate the rear shifter forward, to the fully cable released position: as if shifting the chain to the smallest rear cog. Turn the adjusting barrel of the rear shifter fully into the shifter, then back off one (1) full turn. With little cable tensioning, secure the shifter cable to the cable anchor using a 5mm hex wrench. While turning the crank, rapidly shift the system up and down the cogset several times. Twist the shifter one detent position, to move the chain from the first (smallest) cog to the second cog (see figure 6). If the chain hesitates and does not shift onto the second gear, twist the barrel adjuster at the rear shifter to increase cable tension. If the chain shifts beyond the second cog towards the third cog, release cable tension with the shifter barrel adjuster. Once this is completed, shift the chain up and down the gear cluster to check for clear indexing.

Note: *Even though normal indexing of the ESP system requires low cable tension, new cable and housing components will experience compressionduring their "break-in" period and shifting performance will change as a result. It will be necessary to re-tension the cable linkage via the barrel adjuster after this "break-in" period.*

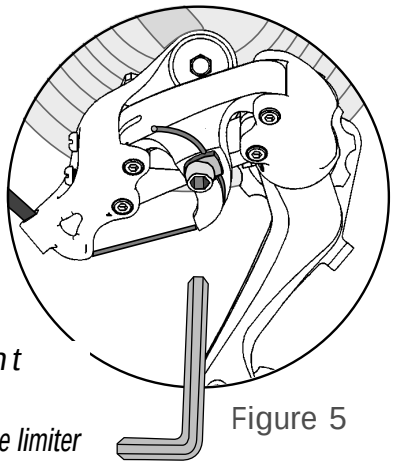
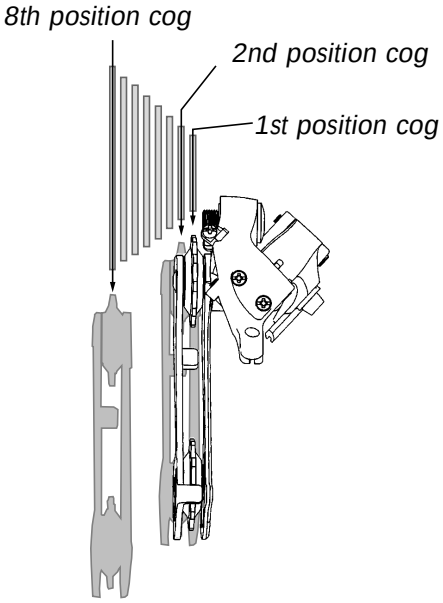


Figure 5

Figure 6



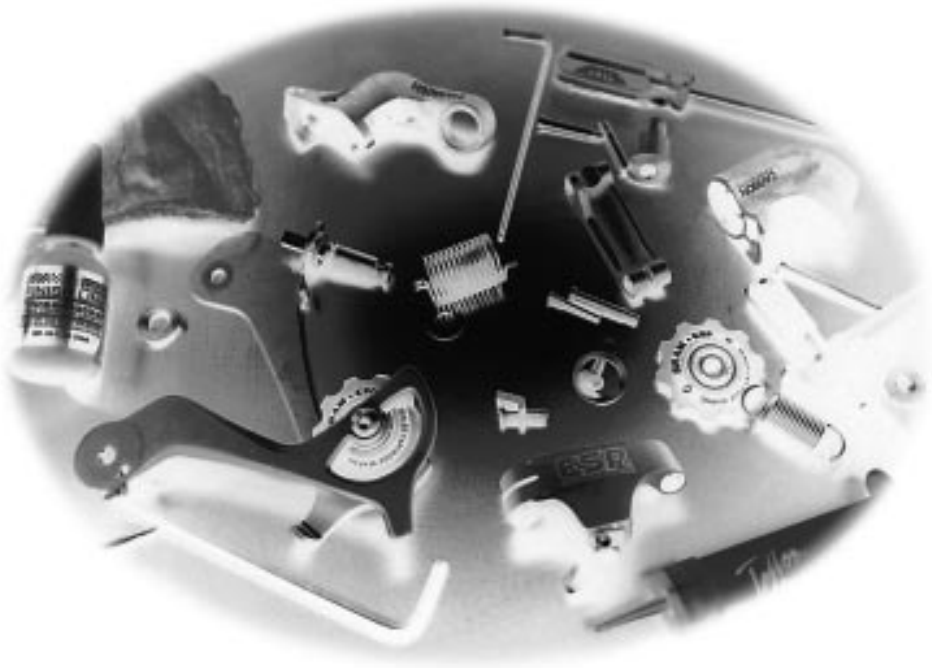
ESP DERAILLEUR SERVICE

The ESP 9.0 rear derailleur is a unique component because it gives you the ability to disassemble, repair, clean, and rebuild almost each of its parts and in turn affect its every function as a high performance mechanism. With that in mind, please follow these instructions to the detail when servicing your derailleur.

The Tools

The best tools you have are your patience and this guide, there's also SRAM Technical Service (check back cover for phone # and address information) for when you're in a real pinch. The real tools you'll need depend on what you're trying to accomplish, check out the parts descriptions on the following pages. Here though are the essentials:

- 2mm hex key, a ball driver works best
- 2.5mm hex key, ball driver or "L" shaped
- 3mm hex key, "L" or "T" shaped
- 5mm hex key,"L" or "T" shaped
- 6mm hex, "L" or "T" shaped
- #1 Phillips head screwdriver
- small slotted/flat tip screwdriver
- 5"-6" needle nose pliers
- SRAM T-Handle "B" nut wrench or adjustable Bottom Bracket slotted spanner
- Fresh pipe cleaners
- Jonnisnot Grease
- High quality teflon fortified bearing grease, e.g. Finish Line™ Teflon Fortified Bicycle Grease
- Thread locking liquid, e.g. Loctite™ 242



ESP DERAILLEUR SERVICE

System Troubleshooting

Friction is the enemy of any linkage-based shifter and derailleur system . Unless there is use of an incompatible component, or there is significant wear and/or visible damage as the result of an impact or a material failure in the system, quality of shifting diminishes because of excess friction build up in:

1) the cable linkage between the shifter and derailleur
2) in the shifter (see page 9 and/or
3) in the derailleur itself.

Cable Linkage Deterioration

As with all other control cable linked shifting systems, excessive cable and housing contamination can also adversly affect ESP performance. For light action indexing systems this means inconsistent response/higher cable tension. Imagine the effect a rusted cable has on an old ten speed bike: how difficult it makes it for the rider to pull his shift lever to move the chain up the cogset; or for the derailleur spring to fight that same rusty cable to move its chain back down.

> *Now remember, precise index shifting depends upon a balance that in itself relies on cable tension: the balance between the derailleur movement as commanded by cable take-up at the shifter (rider effort loads the shifter/cable tension i.e. repositioning the chain up one cog), and the same amount of derailleur movement in the opposite direction (moving the chain down one cog) as commanded by shifter cable release and delivered by the effort of the derailleur spring.*

When excess friction builds up in the cable and housing system, the tolerances of this balance are pushed to the point at which you can only perform an accurate up-shift or down-shift. If barrel adjustment is overused in attempt to "dial" the system balance in, off-center alignment of the cog and the derailleur guide pulley becomes especially noticeable: chain will feed through the misaligned pulley cage and briefly hop or climb onto a nearby cog. This dynamic is also known as "Ghost shifting".

Further linkage deterioration will overpower the ability of the derailleur parallelogram spring to contract; i.e. preventing shifts to the smallest rear cogs. The shifter, as a result of this same linkage deterioration, becomes more difficult to actuate, wether you're twisting a Grip Shift or pushing a lever.

A design feature of the ESP 9.0 system is its unique 1-1 actuation ratio (relationship of shifter movement to derailleur movement). "1-1" provides the rider with light action and precise command over the movements of the derailleur. As part of this design, we altered and simplified the internal cable routing of the ESP rear shifter and added a cable specific mechanical advantage device ("the Fin") to the derailleurs outer link plate. Linkage friction as a result of cable and housing deterioration is therefore, less likely to affect the stronger sprung ESP rear derailleur. As with other systems, though, a poor linkage can still increase the twist torque required of the rider to actuate the shifter.

Fortunately, it is very simple to prevent significant increases in twist torque and maintain index accuracy. This is best achieved by protecting the cable linkage system from contamination, specifically, the rear derailleur housing length. Most conventional cable systems will age quickly in this location as a result of repeated exposure to dirt, mud, even rain or bike washes. Routine maintainence such as purging this section of cable housing with a cleaner or compressed air and lubrication of the cable will help to somewhat reduce the impact of contamination. Use of low friction and protective components like sealed cable housing end caps, low friction polymer coated cables, and/or the *SRAM Bassworm* will better preserve shifting accuracy and maintainence.

ESP DERAILLEUR SERVICE

Maintenance

A major feature of the ESP 9.0 is its functional simplicity. In order for it to perform optimally there are three basic guidelines that must be followed:

1. correct cable/linkage components tension
2. proper alignment and optimized positioning
3. pivot lubricity

These three guidelines are conventional and allow for some freedom or error, but it should be noted that if several of them fall out of compliance then derailleur function will suffer. Note: please see "ESP Troubleshooting" for further information.

1. Optimal sensitivity between your control (the shifter) and what you're trying to affect (the rear derailleur, chain and cogs) is dependent upon the material quality, routing and cleanliness of the cable and housing (linkage) components: see cable and housing guidelines below, and page 10.

2. In order for the ESP rear derailleur to translate cable pull commands sent from the shifter (i.e. to articulate precisely, moving chain to the desired destination cog) the derailleur must operate within certain predetermined spatial relationships to the cogset and frame.

   •the most obvious of these can be achieved by utilizing"compatible" components: matching chains, cogset, and hubs (see the insde cover for the ESP system compatibility information)

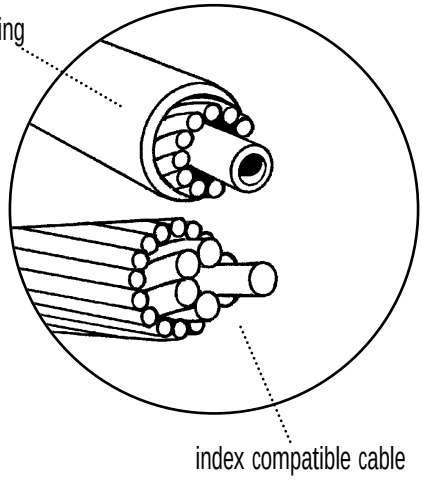
   •correct "D" dimension spacing of the cogset position to the derailleur hanger provides that the articulation of the derailleur (specifically its guide pulley) matches the sprocket centers and shape of the rear cogset: see diagram on next page.

Derailleur hanger.

a) vertical alignment to cogset sprockets: see "Hanger Alignment" views on next page, and;

b) The frame location of the derailleur. This position is fixed as per the intentions of the frame builder, to allow for maximum shifting efficiency as well as ease of wheel removal. Though there is currently no accepted standard for these dimensions, most frames do fall into the tolerances described on the next page. These dimensions optimize shifting accuracy, system wear and tear, as well as wheel removal for SRAM ESP and Shimano rear derailleur systems.

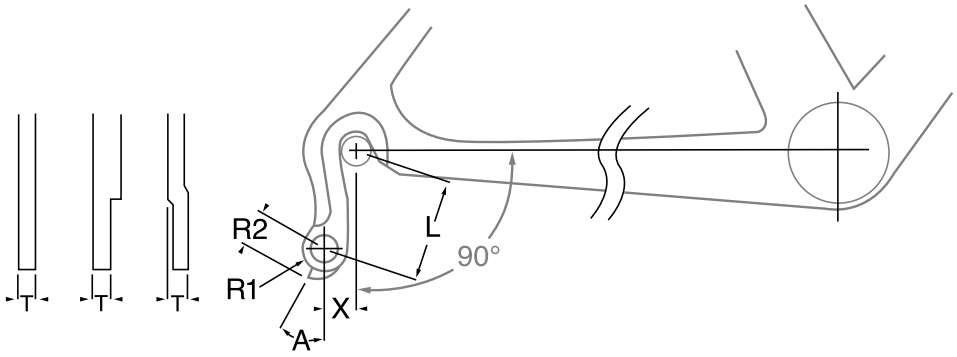
3. Pivot lubricity. There are 8 pivots or bearings in the ESP derailleur that keep its movements quick, precise and long lasting: (4) pivot axles for the parrallelogram, (2) pressed sealed pulley bearings, (1) hanger bolt bearing , and (1) "P" pivot bearing. Please see pages 28-31 for parts description, proper, service and lubrication.



Index cable & housing guide lines

Exterior lined housing/casing	front & rear index compatible	recommended inner cable
5.0 compressionless housing	Y	1.1mm or 1.2mm
4.0 compressionless housing	Y	1.1mm or 1.2mm
3.6 compressionless housing	Y	1.1mm
GORE™ RIDE-ON ™ Cable System	Y	GORE™ RIDE ON™
4.0 coiled/flat wound housing	N	1.1mm or 1.2mm
5.0 coiled/flat wound housing	N	1.1mm or 1.2mm

ESP DERAILLEUR SERVICE



OPTIMAL REAR DERAILLEUR TO FRAME HANGER LOCATION GUIDELINES

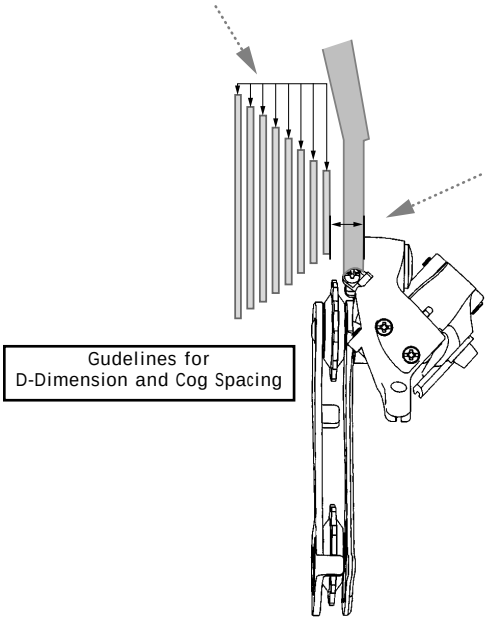
L	X	A	R1	R2	T
26	6-10	30˚-35˚	8.5 MAX.	11.5-13.5	7-8
28	6-10	25˚-30˚	8.5 MAX.	11.5-13.5	7-8
30	7.5-10	25˚-30˚	8.5 MAX.	11.5-13.5	7-8

Note: Dimensions are in millimeters

OPTIMAL CHAIN CAPACITY GUIDELINES FOR ESP REAR DERAILLEUR

TOTAL CAPACITY	38 TEETH	= (BIG RING - SMALL RING) + (BIG COG - SMALL COG)
LARGEST SPROCKET	32 TEETH	
SMALLEST SPROCKET	11 TEETH	
FRONT CHAINWHEEL CAPACITY	22 TEETH	= (LARGE CHAINRING - SMALL CHAINRING)

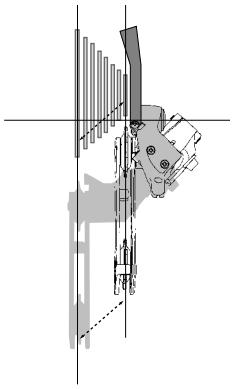
(HG & IG) 8 speed cog centers 4.85mm
(HG & IG) 7 speed cog centers 5.00mm



Gudelines for D-Dimension and Cog Spacing

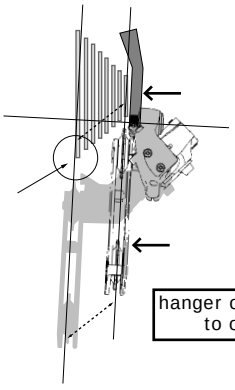
Distance from outboard face of frame hanger to outboard face of the first cog must equal .5" or 12.75mm

normal hanger alignment

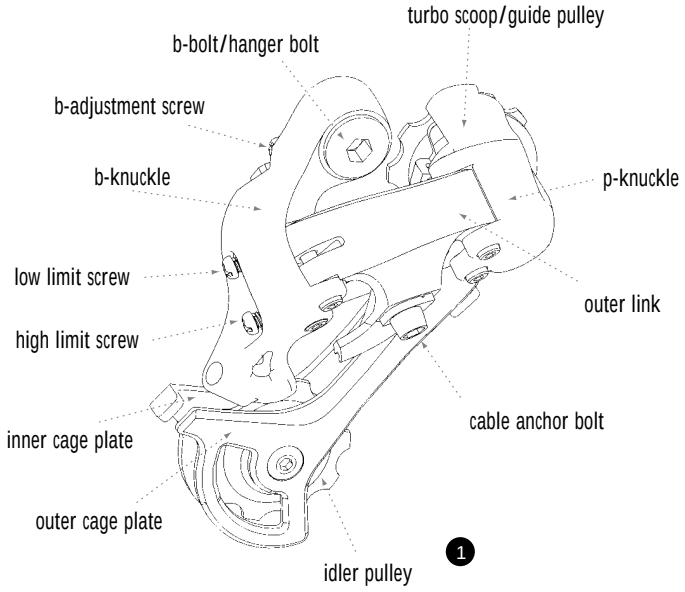


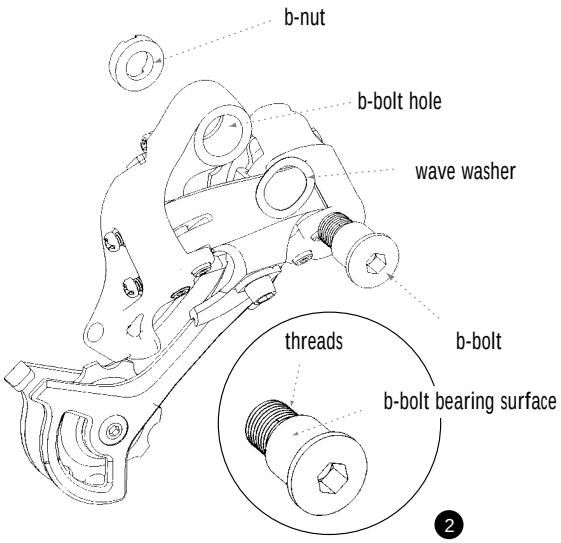
derailleur moves too far inboard under normal cable tension adjustment when the hanger is bent

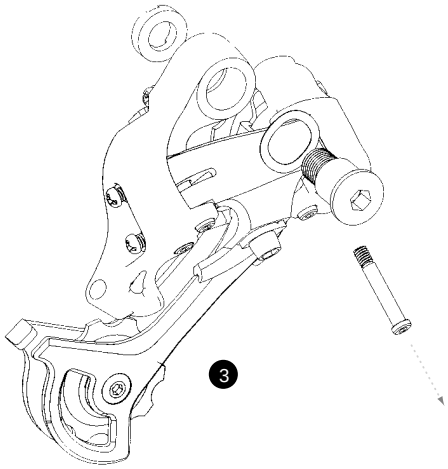
•vertical/parallel alignment of the derailleur and frame hanger is critical to proper indexing: outboard impacts (as shown) will change physical index alignment and degrade shift quality: ***Use a Derailleur Alignment Gauge to straighten the frame!***

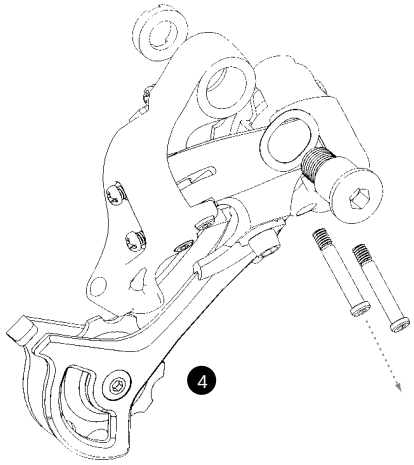


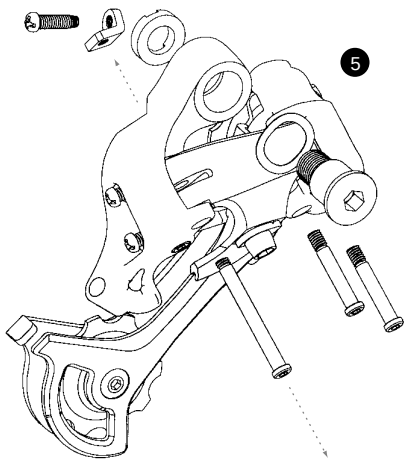
hanger out of alignment due to outboard impact

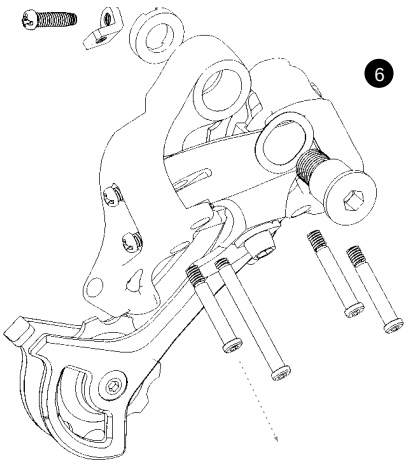

turbo scoop/guide pulley
b-bolt/hanger bolt
b-adjustment screw
b-knuckle
p-knuckle
low limit screw
outer link
high limit screw
cable anchor bolt
inner cage plate
outer cage plate
idler pulley
1


b-nut
b-bolt hole
wave washer
b-bolt
threads
b-bolt bearing surface
2


3


4


5


6

ESP 9.0 DERAILLEUR SERVICE PROCEDURE

B-PIVOT BOLT REMOVAL AND CLEANING

View 2

Remove the derailleur from the frame hanger. Using a 6mm hex key and a "b" nut wrench (or slotted BB spanner) remove the "B" bolt, wave washer and "B" nut from the composite knuckle. Clean any dirt from these parts and the knuckle . Add a light coating of jonnisnot to the bearing surface of the "B" bolt and to the inner diameter of the bolt hole. Add thread locking liquid to the threads of the "B" bolt. Be sure to not spread or overlap these two applications. Reassemble.

PIVOT PIN REMOVAL AND CLEANING

Views 3 & 4

Note: To service the parallelogram pins it is easiest to pull, service, and replace either the front or the rear pins seperately.

To service the front parallelogram pins, loosen each using a 2.5 mm hex key. Carefully remove the pins one by one from the bushing hole(s). Wipe each pin clean of old grease and dirt. Apply a light coat of grease to the shaft of the pin and a light coat of threadlock liquid and let dry. Each bushing has two rubber o-rings that will remain in place, capping both ends of the link bushing (see VIEW 9). Remove, clean and lightly regrease these before reinstalling, or replace them. Clean both bushing holes of debris using a pipe cleaner. Re-align the "P"-nuckle onto the parallelogram links and re-fit the pins with 15 inch/lbs torque.

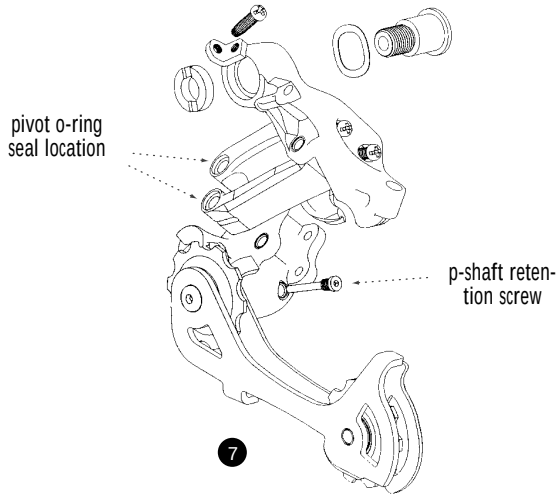
View 5

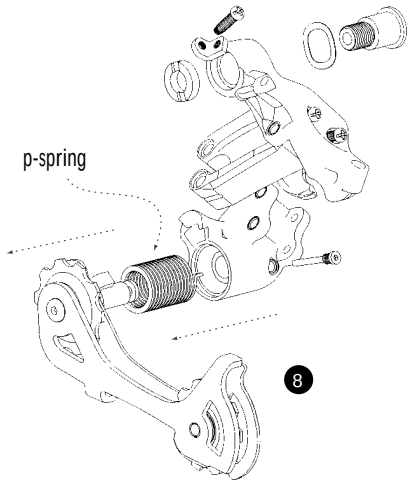
Again using a 2.5 mm hex key, remove the long pin. The "B-bone" will come undone in the process. In order to remove and service this pin, it may be necessary to force the pin out from the top side, through the bushing hole using the 2.5mm hex wrench. Service the pin and bushing as described above. When reinstalling, be sure to add threadlocking liquid to the threads of the "b-bone". Fasten to 15 inch/lbs.

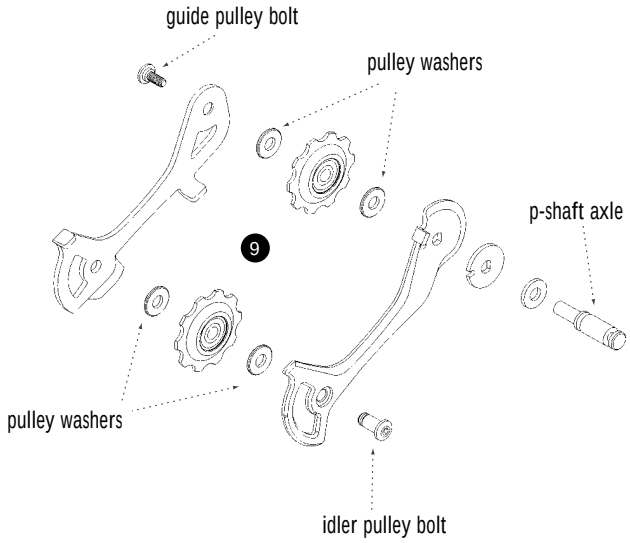
View 6

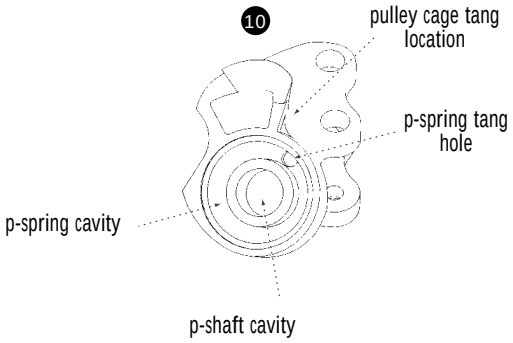
Pull and service the final (short) pin as described in "VIEW 3 & 4"

ESP 9.0 DERAILLEUR SERVICE PROCEDURE









ESP 9.0 DERAILLEUR SERVICE PROCEDURE

P-PIVOT SERVICE AND PULLEY REPLACEMENT

Views 7-10

Upper (guide) pulley or pivot spring assembly servicing will require removal of the pulley cage assembly from the "P-knuckle".

To detach, first remove the "P- shaft" retention screw using a 2mm hex wrench. As this will unload the cage spring, carefully pull the pulley cage away from the "P-knuckle", letting the cage slowly unwind in the direction shown. The recommended lubricant for the spring cavity and the pivot axle in this assembly is Grip Shift Jonnisnot grease (other high viscocity greases may be substituted).

Note: for correct reassembly, be sure to identify the spring tang position in the composite knuckle while pulling the spring out (see view 10).

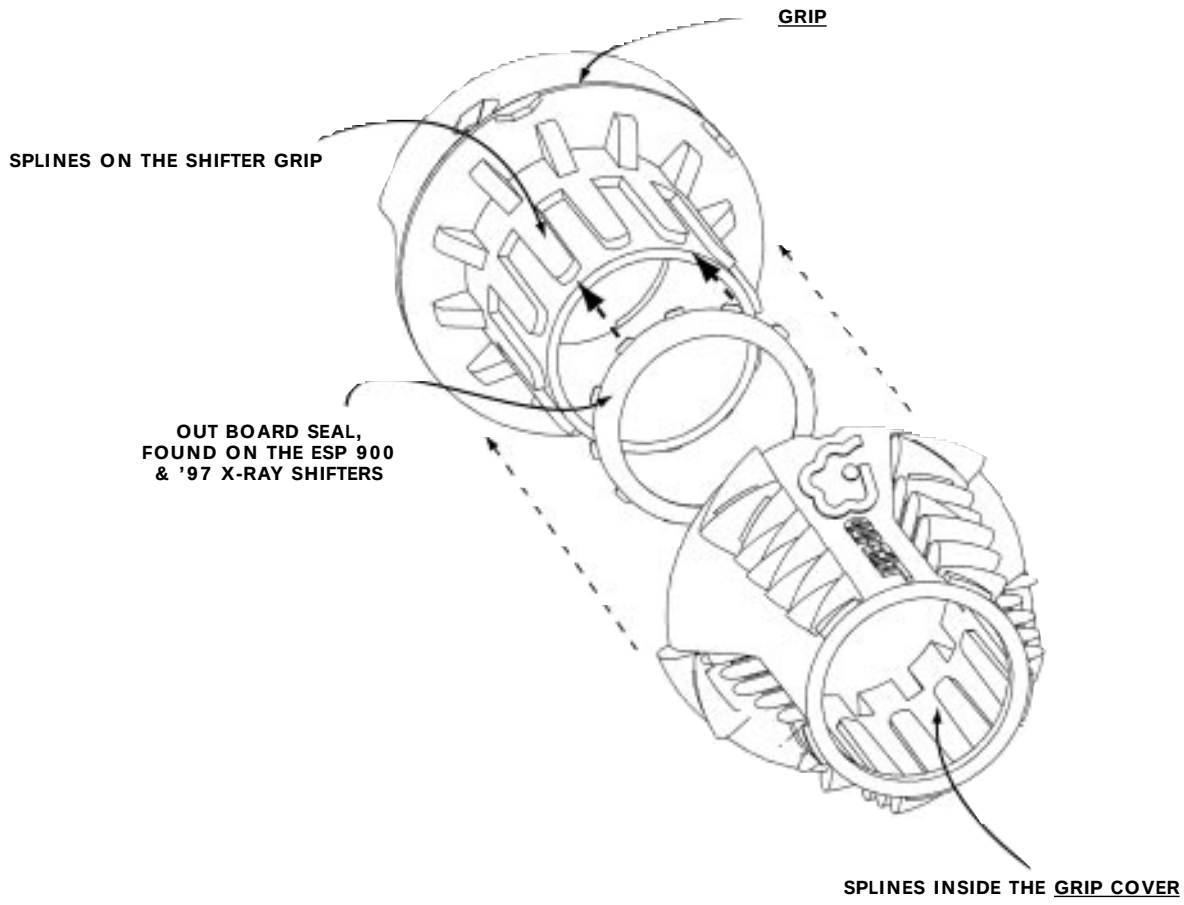
To service the spring assembly, wipe both the spring and the "P-shaft" cavity in the composite knuckle clear of debris. Then clean the "P"-shaft and the spring. Liberally grease these four areas.

Disassemble the pulley cage. Note: When replacing the upper or lower pulleys, be sure to apply a mild thread-locking liquid to the threads of the pulley axle bolts

Reassemble the pulley cage with shaft and spring parts in place. Then reposition the shaft into the knuckle, being certain to replace the spring tang into the desired retention hole inside the composite knuckle.

Using both hands (being careful not to release the spring tangs from their holes) rewind the spring so that the outer pulley cage plate tang parks next to the "turbo scoop" of the Knuckle. Be sure that the cage shaft assembly is fully inserted into the knuckle. Keeping the assembly compressed, lift the parallelogram, and replace the 2mm head, shaft retention screw: this is best done by using one hand to simultaneously pressure the derailleur onto a flat surface and lift the parallogram, and to use the other hand to replace the screw.

GRIP COVER INSTALLATION



WHAT TO KNOW...

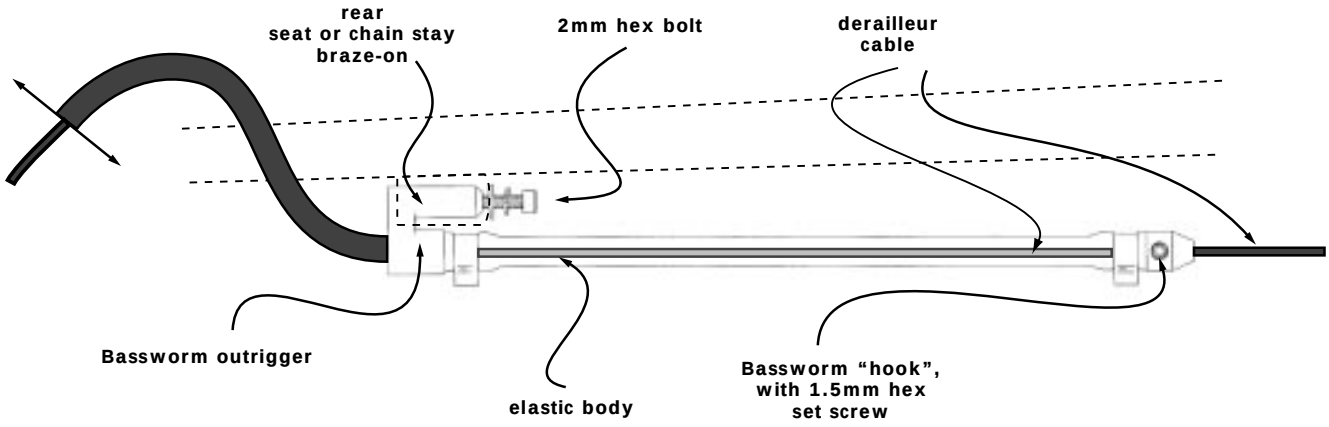
All model SRT and ESP shifters are designed to allow simple replacement of their rubber grip covers.

Caution: *do not use any alcohol, solvents, hair sprays or lubricants to replace any Grip Shift grip covers, stationary grips or replacements of the same manufactured by others. These additives may damage the rubber compounds and/or the plastics in the shifters.*

1 Grip covers can be removed by simply sliding them away, along the molded splines, from the shifter grip. Use only compressed air or water to aid removal.

2 To install new grip covers, soften the rubber in warm water and once again align the molded splines of both parts. Slide into place. For ESP 900 and SRT 800 X-RAY models be sure to match the gear indication notches of both parts.

BASSWORM SEAL INSTALLATION



SEAL INSTALLATION AND CARE

1 For best results, start with a new derailleur cable and cable housing.

2 Using a 2mm hex key, secure the BASSWORM's "outrigger" to the rear cable housing braze-on (see diagram). Be sure to keep the BASSWORM's body away from moving parts/pedaling motion.

3 Thread derailleur cable through the BASSWORM.

4 Thread derailleur cable through rear piece of cable housing. Then insert cable housing into the "outrigger" of the BASSWORM and into the derailleur.

5 Attach the derailleur cable to the derailleur and adjust rear indexing per manufacturers specifications.

6 Gently attach hook to the derailleur cable using a 1.5mm hex key.

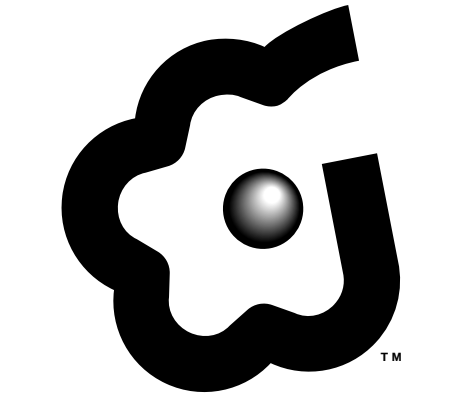
7 Complete optimum sealing of the BASSWORM by plugging the entrance hole of the "hook" with a dab of grease.

8 Check for proper indexing and re-adjust derailleur if necessary.

9 To use the cable tension pre load feature of the Bassworm, be sure the shifter and derailleur are functioning properly first. Shift the chain to the smallest cog and stretch the "hook" forward 1 inch. Gently secure with a 1.5mm hex key.

NOTES

NOTES



SRAM Corporation

SRAM Corporation is a company based in Chicago, Illinois U.S.A. We are dedicated to designing, manufacturing and marketing high quality & high value bicycle components. Our product development group continues to improve and expand our component lines in great part through the input and influence of your opinions as dealers, racers and consumers.

Thank you and we welcome your comments and suggestions.

SRAM Corporation • 361 W. Chestnut Street • Chicago, IL 60610 USA

Customer Service Hotline 800.346.2928

or, 312.664.8800. ext.1