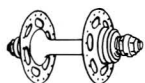


Hub	Trouble Chart	Exploded Drawing	Parts Interchangeability Chart	Disassembly and Assembly Instructions	Cleaning, Points to Check and Lubrication	Axle Thread Size
	page	page	page	page	page	
Brampton (see Sturmey-Archer AW)						
Hercules (see Sturmey Archer AW)						
Sachs (F & S)						
Torpedo 415	5-5	5-28	5-29	similar to H3111		$\frac{13}{32}$ " x 26 TPI
H3102	5-5	5-30	5-21	similar to H3111		$\frac{13}{32}$ " x 26 TPI
Schwinn Approved (see Sturmey-Archer AW)						
Shimano						
Cartridge	4-4	4-8	4-9	4-14	4-16	$\frac{3}{8}$ " x 26 TPI
F and G	4-4	4-8	4-9	4-10	4-13	$\frac{3}{8}$ " x 26 TPI
333	4-4	4-8	4-9	similar to F and G		$\frac{3}{8}$ " x 26 TPI
Sturmey-Archer						
AB/C (see AW)						
AG3 (see AW)						
AW	4-5	4-17	4-17	4-18	4-21	$\frac{13}{32}$ " x 26 TPI
FW	4-6	4-22	4-23	similar to S5		$\frac{13}{32}$ " x 26 TPI
SAB3 (see AW)						
S5 and S5/2	4-6	4-22	4-23	similar to S5.1		$\frac{13}{32}$ " x 26 TPI
S5.1	4-6	4-22	4-23	4-24	4-27	$\frac{13}{32}$ " x 26 TPI
Styre (see Sturmey-Archer AW)						
Sun Tour (see Sturmey-Archer AW)						

WHEEL MOUNTING

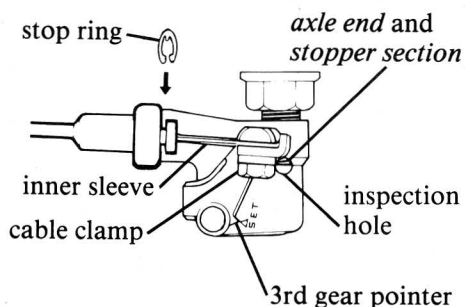
The axle of a multi-speed hub must be firmly held in the dropouts so that it cannot turn. Axle flats, serrated fixing washers or flange nuts and tapped non-turn washers are used to this effect. Make sure serrated parts seat against the *frame* (not against a washer) and non-turn washer tabs engage dropout slot. If the axle become loose in the dropouts it will be necessary to readjust the shift cable.



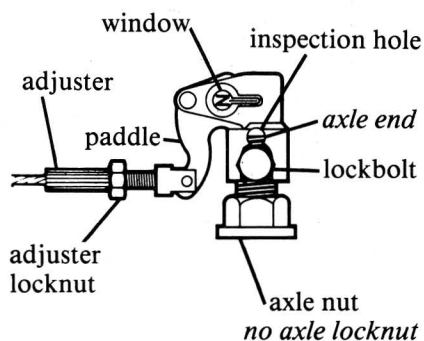
HUBS

THREE, FOUR AND FIVE SPEED HUBS

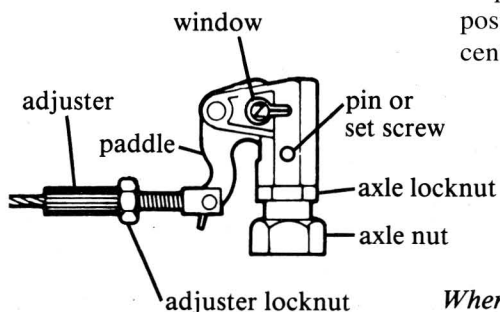
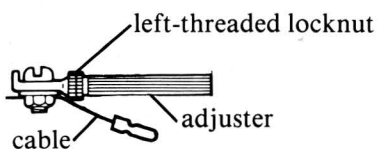
Positron Bell Crank (bottom view)



Lockbolt Bell Crank (top view)



Universal Cable Clamp



Threaded Bell Crank (top view)

TRIGGER INTERCHANGEABILITY

See pages 1-3 thru 1-6 at the beginning of this book for trigger, cable, indicator and bell crank interchangeability.

CABLE ADJUSTMENT

Improper adjustment is the most common cause of problems with 3-, 4- and 5-speed hubs. Many people have quit riding bikes because their hub slipped out of gear when they were standing up in the pedals. Always check trigger and cable operation before deciding to overhaul a hub.

To have a cable that is in proper adjustment and will *stay* that way, all fittings must be tight enough not to creep along the frame, the cable must be free of kinks and knots, the pulley must operate smoothly and the bell crank or indicator chain must not be twisted. (Always back off a thread-on bell crank or an indicator chain $\frac{1}{8}$ of a turn from finger tight.)

Shimano (Cartridge, F, G and 333 Hubs)

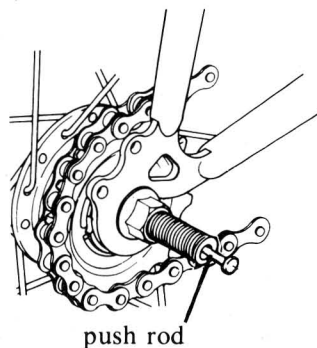
All Shimano Hubs use a bell crank and push rod arrangement. For installation and interchangeability see pages 1-4 and 1-5. Note that push rod length is critical and depends on the length of the axle used.

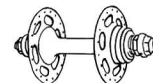
Positron bell crank. Positron bell cranks must be used with Positron triggers and the single-strand, push-pull Positron cable, but the combination can be used on any Shimano hub. The end of the axle must rest against the bell crank stopper section (as visible through inspection hole). To adjust, move the shifter to the 3 position, loosen the cable, click the bell crank to the position marked Set (push hard) and retighten the cable.

Lockbolt and threaded bell cranks. Check for proper installation (pages 1-4 and 1-5). Move paddle to make sure push rod is not missing. Threaded bell crank should be $\frac{1}{8}$ to $\frac{5}{8}$ of a turn from finger tight (pins or set screw bottoming on end of axle with axle locknut loose). Lockbolt bell crank slips on without axle locknut; make sure stopper section contacts the end of the axle, as visible through inspection hole. Adjust cable with trigger in the N or 2 position so that the circled N on the bell crank paddle is centered in its window (see illustration).

Push Rod Length

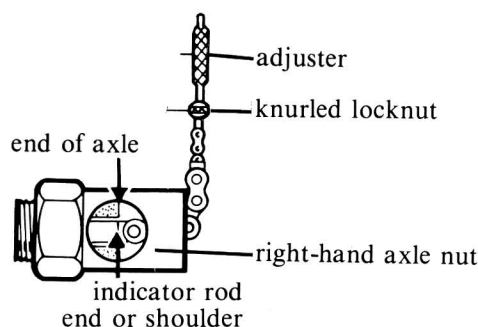
When loosely inserted, proper length push rod protrudes
10-12 mm
 $13/32 - 15/32$ "





Sturmey-Archer 3-Speeds

Make sure that indicator rod is backed off from $\frac{1}{8}$ to $\frac{5}{8}$ of a turn from finger tight. Adjust cable so that the end of the indicator rod is just even with the end of the axle with the shifter in the *N* position.¹ This method may not work with a non-standard indicator chain or axle. If it cannot be used, adjust the cable so that the "dead spot" (pedals freewheeling forward) falls exactly half way between *N* and *H* shift trigger positions. This is best done by moving the pedals quickly back and forth with one hand while slowly pushing the trigger from *H* toward *N*. Count indicator chain links as they come out of the axle before the *beginning* of the dead spot; continue moving the pedals and advancing trigger and count the number of links that emerge between the *end* of the dead spot and the click as the trigger goes to *N*. If these two counts are not the same, adjust the cable and try again. In no case should either gear be closer than $\frac{1}{2}$ link to the dead spot. Tighten knurled locknut against adjuster.



Sturmey-Archer FW (4-speed)

FW hubs use a special 4-speed trigger and indicator chain with a two-piece indicator rod. Hold the indicator chain stationary and make sure the two segments of the indicator rod are tightly screwed together by attempting to tighten the left end (visible in the left end of the hollow axle) with a narrow screwdriver. Adjust the cable so that the *left* end of the indicator rod is even with the *left* end of the axle with the shifter in the *L* position. This only works if the proper length indicator rod is installed for the axle. If in doubt, center the "dead spot" between 3rd and 4th gear as described for the AW.

Sturmey-Archer S5, S5.1

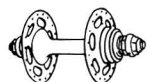
Shift left-hand cable to the extended position. Adjust cable until slack. Move shifter to the other position and tighten cable until bell crank or indicator chain stops moving. Right-hand cable can be adjusted like an AW cable, except that it is the indicator rod *shoulder* that lines up with the end of the axle.



Sachs (F & S)

See page 5-2

¹ If the end of the axle is not visible in the axle nut window, indicator chain will bottom at last link in low gear. Install a spacer under axle nut.



HUBS

SHIMANO F, G and CARTRIDGE TYPE 3-SPEED HUBS TROUBLE CHART

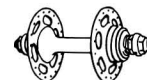
Possible Causes¹

Symptom	Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
3rd gear instead of 2nd	Cable too loose	
2nd gear instead of 1st	No rollers (15)	
Slips in 1st	Driver (31) pawls nearest sprocket faulty, pawl springs weak or broken	Driver (31) pawls or pawl springs nearest sprocket improperly installed
Slips in 2nd	Planet carrier (18) pawls faulty, pawl springs weak or broken	Planet carrier (18) pawls or pawl springs improperly installed
Slips in 3rd	Driver (30) pawls farthest from sprocket faulty, pawl springs weak or broken	Driver (30) pawls or pawl springs farthest from sprocket improperly installed
1st gear instead of 2nd	Cable too tight	
Jumps from 2nd to 1st	Return spring (42) bent or weak	Return spring (42) missing
Sluggish shifting	Left-hand cone (41) misadjusted	
	Axle sun gear (40) chipped or worn	
Jumps from 3rd to 2nd	Ring gear (10) pawls faulty	Cable return spring missing
2nd gear instead of 3rd		Ring gear (10) pawls improperly installed
3rd gear only		Cartridge type driver (30) installed with F type axle (40)
		Right-hand sliding key (39) missing or displaced
		Left-hand sliding key (38) (39) missing or displaced
Runs stiffly or noisily	One pawl of a pair faulty	One pawl of a pair improperly installed
	Axle (40) bent	
	Gear teeth chipped or worn	F type left-hand cone (41) installed with cartridge type axle (40)
	Dropouts not parallel	Ball retainer reversed
	Improper or no lubrication	
	Loose or broken parts inside hub	
	Chain too tight	
	Gear teeth chipped or worn	
	Cones too tight	
	Ball retainer broken or damaged	

¹ Parts numbers in parenthesis refer to parts chart and exploded drawing.

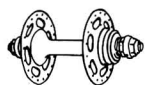
**STURMEY-ARCHER AW
3-SPEED HUB
TROUBLE CHART**

HUBS



Symptom	Possible Causes ¹	
	Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
2nd gear instead of 1st	Clutch spring (32) bent or too long	Low gear pawls (12) installed in gear ring (20) by mistake
Jumps from 1st to 2nd		Thrust ring (19) not seated over axle key (16) flats
Slips in 2nd		No washer under right-hand axle nut (31); indicator chain bottoms out at last link
	Cable too loose	Indicator not fully screwed in
	Indicator threads stripped	
	Gear ring (20) dogs worn	
Jumps from 3rd to 2nd	Clutch (18) worn	Gear ring (20) pawls or springs improperly installed
	Pinion pin (15) ends worn	
	Gear ring (20) pawls sticking or worn, pawl springs weak or broken	
Slips in 3rd	Cable too tight	
	Dirt between axle (9) and clutch (18)	
Sluggish shifting	Weak or bent clutch spring (32)	
Slips in 1st	Right-hand cone (5) too loose	
	Cable sticks; indicator chain twisted	
	Planet cage (11) pawls sticking or pawl springs weak	Planet cage (11) pawls or springs improperly installed
	Corroded parts, improper or no lubrication	Spring cap pinched between right-hand cone and driver
	Chain too tight	Too many balls in ball ring (22)
	Cones (5) too tight	One pawl of a pair improperly installed
	One pawl of a pair sticking	Ball retainer reversed
	Chainstay ends not parallel	
Stiff running or noisy	Axle (9) bent	
	Loose or broken parts inside hub	
	Dust caps distorted	
	Ball retainer (7) damaged or broken	

¹ Parts numbers in parenthesis refer to parts chart and exploded drawing.



HUBS

STURMEY-ARCHER FW, S5 and S5.1 FOUR AND FIVE SPEED HUBS TROUBLE CHART

Possible Causes¹

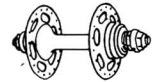
Symptom	Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
3rd gear instead of 1st or 2nd		Low gear pawls (12*) installed in gear ring (20) by mistake
		Thrust ring (19*) not seated over axle key flats (14)
Jumps from 1st or 2nd to 3rd	Clutch spring (32*) bent or too long	No washer under axle nut (31*) (1); indicator chain bottoms out at last link
Slips in 3rd	Cable too loose	Indicator (19) not fully screwed in
	Indicator (19) threads stripped	
	Clutch (18*) worn	
	Gear ring (20*) dogs worn	
2nd gear instead of 1st and 4th instead of 5th	Compensator spring bent, weak, or damaged (FW)	Compensator spring missing (FW)
	Primary sun pinion (10) dogs or axle (13) dogs worn; faulty coiling of low gear spring (12)	
Slips in 1st gear	Left cable too slack (S5, S5.1)	
Jumps from 5th to 3rd	Pushrod too short (S5)	
	Bellcrank paddle slipped past pushrod (S5)	
	Left cable too tight (S5.1)	
	Weak pinion return spring (7) (S5.1)	Pinion return spring (7) missing
Slips in 2nd gear	Dog ring locknut (4) loose (S5, S5.1)	
Jumps from 4th to 3rd	Dog ring (6) teeth worn	Pinion sleeve reversed (FW, S5)
	Low gear spring (12) weak	Pushrod too long (S5)
	Left cable too tight (S5)	
	Left cable too slack (S5.1)	

(cont.)

Next Page



¹ Parts numbers followed by * refer to AW parts chart p. 4-17, others to S5 parts chart p. 4-22.



**STURMEY-ARCHER FW, S5 and S5.1
FOUR AND FIVE SPEED HUBS
TROUBLE CHART (cont.)**

Symptom	Possible Causes ¹	
	Resulting from wear, improper lubrication or abuse	Resulting from improper assembly or installation
Jumps from 4th and 5th to 3rd	Planet cage (15) dogs worn	Gear ring (20*) pawls or springs improperly installed
	Clutch (18*) worn	
Slips in 4th and 5th	Gear ring (20*) pawls sticking or worn	Clutch spring (32*) missing
	Cable too tight	
Slips in 1st and 2nd	Dirt between axle (13) and clutch (18*)	Planet cage (15) pawls or springs improperly installed
	Weak or bent clutch spring (32*)	
Stiff running or noisy	Right-hand cone (5*) too loose	Wide S3C ball ring (22*) installed in other hub
	Cable sticks; indicator chain (19) twisted	
Shifts poorly	Planet cage (15) pawls sticking or pawl springs weak	Too many balls in ball ring (22)
	Corroded parts, improper or no lubrication	
Stiff running or noisy	Chain too tight	One pawl of a pair improperly installed
	Cones (5*) too tight	
Stiff running or noisy	Chainstay ends not parallel	Planet pinions (16) incorrectly timed (marked teeth must point outward at once)
	Axle (13) bent	
Stiff running or noisy	Loose or broken parts inside hub	Pinion return spring washer (8) missing
	Distorted dust caps	
Shifts poorly	Ball retainer damaged or broken	Pinion return spring washer (8) missing
	Compensator spring bent, weak or damaged (FW)	
Shifts poorly	Dirt between axle (13) and clutch (18*)	Pinion return spring washer (8) missing
	Clutch spring (32*) weak or bent	
Shifts poorly	Right cone (5*) too loose	Pinion return spring washer (8) missing

¹ Parts numbers followed by * refer to AW parts chart p. 4-17, others to S5 parts chart p. 4-22.