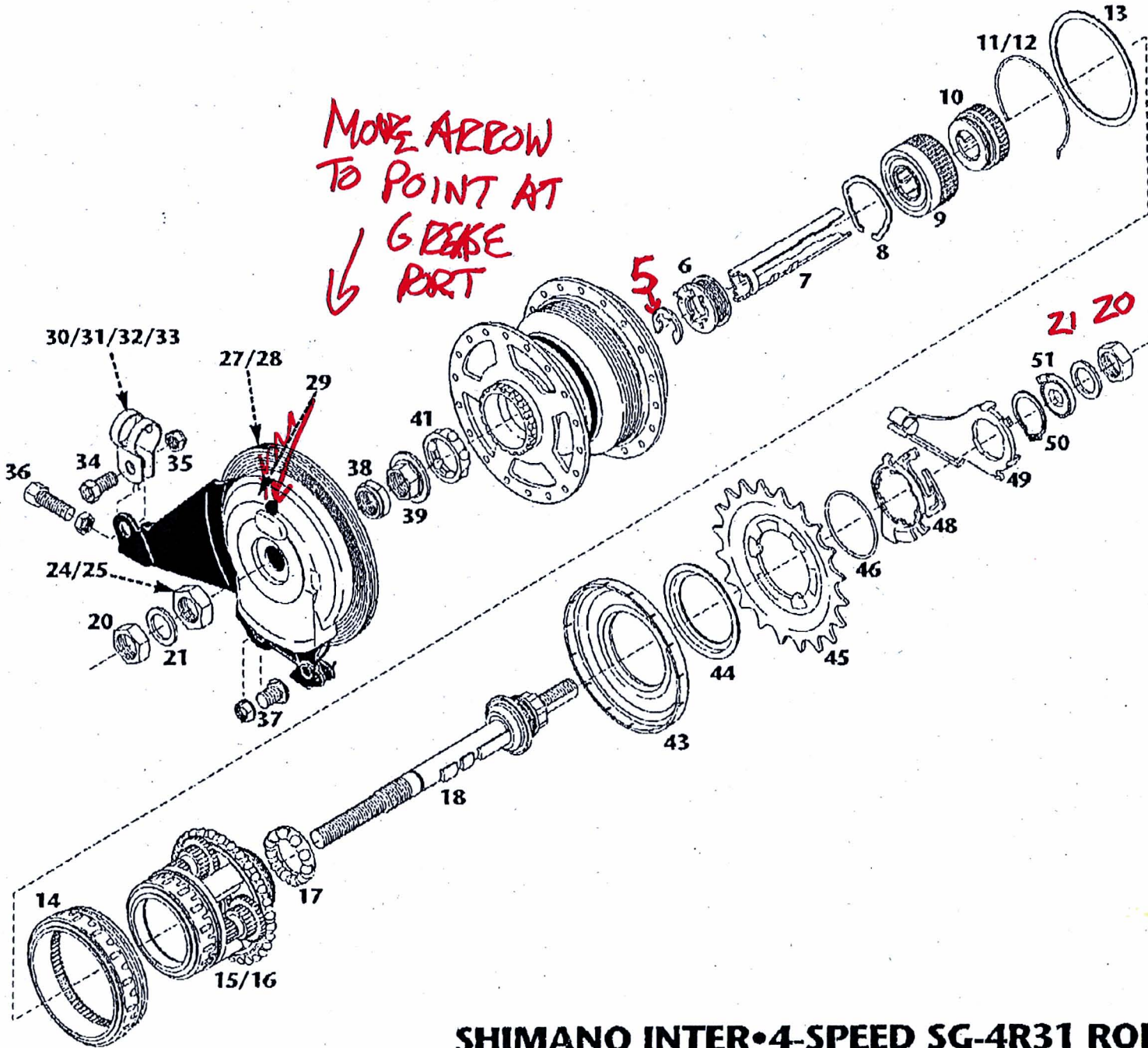
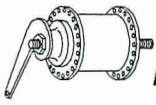


SHIMANO INTER-4-SPEED SG-4C30 COASTER BRAKE



SHIMANO INTER•4-SPEED SG-4R31 ROLLER BRAKE





# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED COASTER & ROLLER BRAKE

### How It Works

These hubs are very similar, and are also similar to the Shimano 7-speed hub in that a rotating sleeve (cam) on the axle exposes ~~releases~~ or blocks a number of different ratchets and pawls. Unlike the 7-speed hub, however, the 4-speeds gear up but not down. ~~This~~ Only gearing up simplifies the transfer of torque to the coaster brake in the SG-4C30, since the driver and planet cage are one unit. Drive to the coaster brake cam is always direct and positive.

The 4-speed hubs use three sun gears, which mesh with the three sets of teeth ~~gears~~ of the three-gear planet pinions. The drive ratio depends on ~~Shifting is accomplished according to~~ which of the sun gears is connected to the axle. If none of the sun gears is connected to the axle, drive is direct (unity ratio) through the driver/planet cage to the hub shell ~~to pawls on the left end of the driver/planet cage, or on the brake cam assembly in the coaster brake version.~~

Each of the sun gears, when engaged, gives a different, higher ratio. ~~Drive is transferred from the planet pinions~~ Drive is transferred from the planet pinions is transferred to the hub shell through a gear ring which meshes with the middle set of teeth ~~central gear~~ of the planet pinions. Somewhat unusually, the roller brake gear ring of the coaster brake version of this hub drives the hub shell not through pawls but through a roller clutch ~~cam assemblies~~: one on the gear ring and another on the driver/planet cage. The coaster brake version uses a roller cam assembly on the gear ring and conventional pawls on the brake cam, which is splined to the planet cage.

These hubs are most efficient in their lowest, direct-drive gear. Third gear is also relatively efficient, since it uses simple planetary gearing. ~~Second~~ and fourth gear use compound planetary gearing. The step-up ratio in fourth is greater than with any other commercial bicycle hub gear.

### Gearing

Because they only gear up, these hubs require a very low chainwheel/sprocket tooth ratio. The 21-tooth sprocket supplied with these hubs requires a 32-tooth chainwheel to achieve a reasonable range of 41 to 76 inches (3.3 m to 6.1 m development) in a 27-inch (700 cm) wheel. With a large-wheel bicycle, it is best to use the largest sprocket you can get. Sachs makes a compatible 24-tooth sprocket, which would be appropriate with a 36-tooth chainwheel. ~~You could fashion a larger sprocket yet by reshaping the lugs on a Shimano cassette sprocket. Use a spacer washer with this narrow sprocket when securing it to the driver.~~

On a ~~These hubs are especially suitable for small-wheeled bicycle, s;~~ then the high gears are an advantage, reducing the size of the required chainwheel.

### Service Notes

Servicing is relatively simple and straightforward if you do not disassemble the driver/planet cage subassembly. ~~If any part of it requires replacement, there~~ There is usually is no reason to disassemble it, since it is only sold as a unit. However, it can be disassembled to remove the planet pinions and pinion pins, allowing more through inspection and cleaning.

Like the 7-speed, the 4-speeds have several sets of small pawls inside the sun gears. You must never force assembly or disassembly, or you may damage, dislocate or lose one of the pawls. They are only replaceable with their complete sun gear unit.

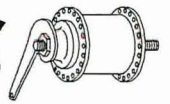
# SUTHERLAND'S

conversion failed to remove provisions - beside of earlier versions -

Few would do this



# INTERNAL MULTI-SPEED HUBS



## Alignment

See Chapter 11 additions for hub measurements.

## INSTALLING CABLE

**Thumb-shifter:** Place the shifter on the right end of the handlebar with its body facing the rider, so the indicator dial is visible. Pull on the cable while pushing on the flat side of the shift lever to shift into first gear position. The cable may now be threaded into the hole under the shift lever, onto the pulley inside and out the adjusting barrel at the far side. If necessary to remove pieces of a broken cable, you may remove the top cover, which is secured by a single screw.

**Revo-shift:** The twist grip mounts inboard of the right brake lever. It is intended for flat handlebars, not for racing handlebars, as it must be mounted on a straight part of the handlebar.

Place the "Revo-shift" twist grip shifter in first gear position. Then remove the cable end cover. Insert the cable into the hole revealed by removing the cable end cover. The cable end must be straight, and clean-cut (not frayed.) If it is difficult to insert the cable, undo the screw which secures the pulley cover, and remove the pulley cover. Then insert the cable through the hole in the cable end cover, and pass it around the three pulleys and into the hole in the cable adjusting barrel. Replace the pulley cover and replace the screw. Be careful not to snag the cable between the pulleys and the pulley cover.

## Hub End of Cable (Both Types of Shifter)

Install the attachment bolt, washer and nut to the hub end of the cable. While pulling the cable out of the housing with the housing fully seated in the adjusting barrel at the twist grip, the attachment bolt assembly should be 90 mm from the end of the cable housing.

Pass the cable around the cassette joint pulley, holding it so the pulley attachment nut points toward the outside (toward the dropout). Then align the flat part of the pulley attachment washer with the slot in the cassette joint, and insert the bolt assembly into the slot.

Rotate the cable counterclockwise by 90 degrees and slide it down into the slot.

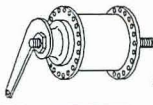
Install the cable to the pulley. Pass the cable through the slot in the cassette joint bracket and insert the end of the cable housing firmly into the housing stop of the bracket.

Reinstall the cable end cover on the twist grip control.

## INSTALLATION OF CASSETTE JOINT TO HUB

Align the yellow mark on the cassette joint pulley to the yellow marks on the right side of the hub axle assembly. Then align the yellow marks on the cassette joint bracket with the yellow mark on the cassette joint pulley. Secure the cassette joint to the hub by inserting the snap ring into the groove in the right hand lock nut.





# INTERNAL MULTI-SPEED HUBS

## ASSEMBLY OF WHEEL TO FRAME

Run the chain over the sprocket and insert the hub axle into the dropouts.

Install the non-turn washer onto the right side of the axle. Rotate the cassette joint so the tab of the washer goes into the dropout slot. The cassette joint should be nearly parallel with the chainstay.

Two types of non-turn washers are supplied, one for forward dropouts and another for track-type dropouts. Use the appropriate non-turn washer. The black washer is for forward-facing dropout slots and the gold one is for track-type dropout slots which face directly toward the rear.

If installing the SG-4R31 hub with external hub brake, now install the brake (*see page 16-5*). Install a serrated flat washer (without a non-turn tab) on the left end of the axle.

Adjust the chain slack and secure the wheel to the frame using the cap nuts. If attaching a fender stay or similar fitting to the axle, place it over the non-turn washer (and corresponding serrated washer on the left side). Then add an additional flat washer over the stay and under the cap nut. Then tighten the brake arm clip. Be sure that it does not apply excessive force to the brake arm, or it may impede rotation of the wheel. Attach the cable housing to the frame using cable clips.

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## CABLE ADJUSTMENT

Place the twist grip shifter in fourth gear position. Check that the red markers on the cassette joint bracket and pulley are aligned with one another. There are two sets of lines, on the top and bottom. Use whichever set is most convenient. If the marks do not line up, turn the cable adjusting barrel at the twist grip. Then shift from 4th gear to 1st and back to 4th and check the alignment of the marks again.

After having adjusted the shift lever, trim and cap the end of the cable.

## SHIMANO INTER•M 4-SPEED ROLLER BRAKE HUB

**CAUTION:** Like any hub brake, the Inter-M brake can become extremely hot in use. Its external location makes it easier to contact than a coaster brake. After use or testing, let it cool down before working on it.

## BRAKE CABLE INSTALLATION

Install the brake arm to the left chainstay using a brake arm clip. Do not tighten fully. Then tighten the brake unit fixing nut (which attaches the brake unit to the hub). If the brake arm will not easily turn to align with the brake arm clip, loosen the brake unit fixing nut, then after realigning, tighten this nut once again.

While depressing the brake lever, insert the brake cable end into the hole in the lever body. Align the end of the cable with the hole in the cable bracket in the lever and turn the cable slot ~~as shown~~ and insert the ferrule into the bracket. Turn the adjusting barrel on the brake arm until it extends 20 to 23 mm from the brake arm as shown. Pass the the cable through the adjusting barrel and through the hole in the clamp bolt.

Verify that the two ends of the cable housing are firmly seated into the adjusting barrels at the

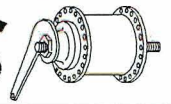
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# SUTHERLAND'S

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# INTERNAL MULTI-SPEED HUBS

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lever and brake. Position the end of the cable under the brake actuating rod. Pull the brake actuating rod all the way back toward the rear of the bicycle (away from the cable). While pulling the cable taut, tighten the cable clamp bolt.

After having checked that the wheel does not turn freely when pulling on the brake lever, pull the lever all the way to the handlebar about 10 times, to seat the cable. Note: if the cable is not seated, it will have to be adjusted again after a short period of use.

## **BRAKE CABLE ADJUSTMENT**

### **Method when readjusting the brake:**

Turn the adjusting barrel until there is approximately 15 mm of play at the end of the lever. The play in the lever is the distance between the rest position of the end of the lever and the position at which braking resistance is suddenly felt.

### **Method when replacing the brake unit:**

Turn the cable adjusting barrel until the adjustment mark on the brake arm lines up with the one on the brake actuating rod. These marks serve as a guide when replacing the brake unit, but are no longer accurate once the brake has been used. Apply the brake to check the braking performance, then secure the adjusting barrel using its locknut.

*This page OK*

*end of first fax  
transmission  
from John Allen*





# INTERNAL MULTI-SPEED HUBS

## Troubleshooting Chart – Shimano Inter•4 Speed

SYMPTOMS	Resulting from wear, improper lubrication, or abuse	Resulting from improper assembly or installation
1. Brake grabs or squeals.	<ul style="list-style-type: none"> <li>Incorrect or insufficient internal lubrication.</li> <li>Brake arm forcing brake cone out of line.</li> <li>One pawl of a pair faulty.</li> </ul>	Brake arm [26] (27 or 28) loose at frame.
2. Stiff running, noisy.		<ul style="list-style-type: none"> <li>Drop-outs not parallel.</li> <li>Chain too tight.</li> <li>Cones too tight.</li> <li>Bent dustcap.</li> <li>Broken or chipped gear teeth.</li> </ul>
3. Driver/planet cage covers or partly covers E-clip groove of axle.	<ul style="list-style-type: none"> <li>Ball retainer damaged or broken.</li> </ul>	<ul style="list-style-type: none"> <li>Friction spring inside hub shell [42] improperly seated.</li> <li>Large bearing retainer of driver [15 or 16] installed upside down.</li> <li>Small bearing retainer of driver [17] installed upside down.</li> </ul>
4. Hub jams in one or more gears.	<ul style="list-style-type: none"> <li>Axle bent.</li> <li>Pawls inside sun gear [9,10,16f] jammed.</li> </ul>	Axle sleeve [7] improperly seated.
5. Hub will not shift to all gears (cable slack in lower gear; or lever will not move to higher gear).		<ul style="list-style-type: none"> <li>Gears and pawls improperly seated.</li> </ul>
6. Jumps to next higher or lower gear.	<ul style="list-style-type: none"> <li>Broken or displaced parts inside hub.</li> <li>Axle sleeve [7] bent, worn or chipped.</li> </ul>	Cable too tight or loose.
	<ul style="list-style-type: none"> <li>Return spring [6] weak or damaged.</li> <li>Cable frayed, kinked or unlubricated.</li> </ul>	<ul style="list-style-type: none"> <li>Cassette joint assembly incorrectly installed.</li> <li>Cable out of adjustment.</li> </ul>
7. Slips in 1st gear.	<ul style="list-style-type: none"> <li>External rollers of driver/planet cage (15 or 16) or pawls of cam unit [4] do not engage.</li> </ul>	<ul style="list-style-type: none"> <li>No planet pinions.</li> <li>No gear ring.</li> </ul>
8. 1st instead of 2nd 3rd and 4th.	<ul style="list-style-type: none"> <li>External rollers of gear ring [14] do not engage.</li> <li>Friction spring [42] in hub shell weak.</li> <li>Stripped teeth of gear ring [14].</li> <li>Stripped teeth of middle gear of planet pinion [16b].</li> </ul>	
9. Rough, or jumps in 2nd, 3rd and 4th.		<ul style="list-style-type: none"> <li>Friction spring inside hub shell [42] absent.</li> </ul>
10. 1st instead of 2nd.	<ul style="list-style-type: none"> <li>Internal pawls of sun gear 1 [16f] inside planet cage do not engage.</li> <li>Stripped teeth in rightmost gear of planet pinion [16b] and/or sun gear 1 [16f].</li> </ul>	
11. Rough, or jumps in 2nd.		

- ( ) Indicates part number for both hubs.
- ( ) Indicates part number for Roller Brake hub.
- [ ] Indicates part number for Coaster Brake hub.

**SUTHERLAND'S**

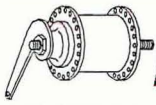
# INTERNAL MULTI-SPEED HUBS

## Troubleshooting Chart – Shimano Inter•4 Speed

SYMPTOMS	Resulting from wear, improper lubrication, or abuse	Resulting from improper assembly or installation
12. 2nd (or 1st) instead of 3rd. Rough, or jumps in 3rd.	Internal pawls of sun gear 2 {10} do not engage. Stripped teeth of sun gear 2 {10}.	
13. 3rd (or lower gear) instead of 4th.	Internal pawls of sun gear 3 {9} do not engage.	
14. Rough, or jumps in 4th.	Stripped teeth in leftmost gear of planet pinion {16b} and/or sun gear 3 {9}.	
15. Excessive brake lever travel (SG-4R31).	Brake shoe [2] or hub (brake) shell (27 or 28) glazed or worn. Wrong lubricant.	
16. Excessive pedal travel before brake engages (SG-4C30).	Rollers of roller clutch of brake unit (27 or 28) or cam unit [4] do not turn freely.	
17. Brake does not release or releases erratically.	Friction spring of cam unit [4] weak.	Friction spring of cam unit [4] absent.
18. No brake.		

- { } Indicates part number for both hubs.
- ( ) Indicates part number for Roller Brake hub.
- [ ] Indicates part number for Coaster Brake hub.





# INTERNAL MULTI-SPEED HUBS

## PARTS LIST FOR SHIMANO INTER•4-SPEED SG-4C30 COASTER, SG-4R31 ROLLER BRAKE

*3 sets of numbers???*

*Numbers in this chart sort of match those of coaster hub but not roller hub*

ITEM NO	DESCRIPTION	PART NO FOR SG-4C30	PART NO FOR SG-4R31
1	Internal Assembly (Axle length 165.6mm)	33V 9801	
	Internal Assembly (Axle length 169.5mm) for O.L. 123.5mm		33U 9801
	Internal Assembly (Axle length 169.5mm) for O.L. 127mm		33U 9802
	Internal Assembly (Axle length 185.5mm) for O.L. 123.5mm		33U 9803
	Internal Assembly (Axle length 185.5mm) for O.L. 127mm		33U 9804
2	Brake Shoe Unit	330 9801 <sup>1</sup>	
3	E-Clip (stop ring), 9mm ID, brass plated	324 3200 <sup>1</sup>	
4	Cam Unit	33V 9004	
5	E-clip (stop ring), 9.6mm ID, chrome plated	33Y 1900	33Y 1900
6	Return Spring Unit	33U 9001	33U 9001
7	Sleeve	33Y 1500-1	33Y 1500-1
8	Internal Circlip (C-ring)	33Y 3900	33Y 3900
9	Sun Gear Unit 3	33V 9014	33V 9014
10	Sun Gear Unit 2	33V 9013	33V 9013
11	Gear Ring Circlip (stop ring), type A	33Y 3000	33Y 3000
12	Gear Ring Circlip (stop ring), type B	33U 0300	33U 0300
13	Gear Ring Washer (Type A only)	33Y 2900	33Y 2900
14	Gear Ring Unit	33V 9008	33Y 9100
15	Driver/Planet Cage Unit (A type)	33V 9802	33U 9805
16	Driver/Planet Cage (B-type)	33V 9805	33U 9811
16a	large bearing retainer		
16b	planet cage pinions (3)		
16c	pinion pins (3)		
16d	wire circlip		
16e	flat circlip		
17	Bearing Retainer (3/16" x 11)	308 9808	308 9808
18	Axle Unit (Axle length 165.6 mm)	33V 9803	
	Axle Unit (Axle length 169.5 mm) for O.L. 123.5mm		33U 9806
	Axle Unit (Axle length 169.5 mm) for O.L. 127mm		33U 9807
	Axle Unit (Axle length 185.5 mm) for O.L. 123.5mm		33U 9808
	Axle Unit (Axle length 185.5 mm) for O.L. 127mm		33U 9809
19	Cap Nut (3/8")	314 1401 <sup>1</sup>	
20	Hub nut (9mm)		200 0300
21	Washer (3.2mm thick)	220 0601 <sup>1</sup>	220 0601
22	Lock nut (3.5 mm thick, 17mm flats)	321 3801 <sup>1</sup>	
23	Lock nut (stop nut), 22mm flats	335 4810 <sup>1</sup>	
24	Brake Unit Fixing Nut (8.2mm thick) for O.L. 123.5mm		75V 1300

*165 Sun gear 7*

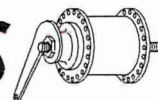
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*MISSING INCOM-PATIBLE TY BARS*



# INTERNAL MULTI-SPEED HUBS



## PARTS LIST FOR SHIMANO INTER•4-SPEED SG-4C30 COASTER, SG-4R31 ROLLER BRAKE

NOTE NEW CORRECTION  
8/31 10 AM  
↓

ITEM NO	DESCRIPTION	PART NO FOR SG-4C30	PART NO FOR SG-4R31
25	Brake Unit Fixing Nut (9.7mm thick) for O.L. 127mm		75V 1301
26	Brake Arm Unit <u>33V 9005</u>		
27	Inter-M Brake Unit w/o Fin		75T 9802
28	Inter-M Brake Unit w/Fin		75S 9802
29	Grease Hole Cap		75V 1601
30	Brake Arm Clip Unit (15mm diameter)		75U 9813
31	Brake Arm Clip Unit (5/8" diameter)	330 9812 <sup>1</sup>	75U 9811
32	Brake Arm Clip Unit (11/16" diameter)		75U 9812
33	Brake Arm Clip Unit (3/4" diameter)	330 9813 <sup>1</sup>	75U 9810
34	Clip Screw	333 0702 <sup>1</sup>	
35	Clip Nut	282 2903 <sup>1</sup>	
36	Brake Cable Adjusting Bolt and Nut		317 9806
37	Inner Cable Fixing Bolt and Nut		75Y 9804
38	Lock Nut for Left Hand Cone		31Z 0600
39	Left Hand Cone w/Dust Cap		33U 9810
40	Bearing Retainer B (3/16" x 16)	33V 9804	
41	Bearing Retainer A (1/4" x 7)		321 9022
42	Hub Shell Slide Spring	33V 0600	
43	Right Hand Dust Cap A	33Y 0501	33Y 0501
44	Right Hand Dust Cap B	33Y 5000	33Y 5000
45	Sprockets <sup>2</sup>		
46	Sprocket Circlip <sup>2</sup>		
47	CJ-4530 Cassette Joint Unit	74Z 9802	74Z9802
48	Cassette Joint Pulley	74Z 0200	74Z0200
49	Cassette Joint Bracket	74Z 9803	74Z9803
50	Cassette Joint Snap Ring (20mm diameter)	33Y 4300	33Y 4300
51	Non-Turn Washer 1 (Black)	33Z 2010	33Z2010
51	Non-Turn Washer 2 (Gold)	33Z 2020	33Z2020

New Comment 8/31  
Arent these parts of #47?

1 Same as Shimano Inter•7-Speed with Coaster Brake SG7C21.  
2 (See Sutherland's Handbook of Coaster Brakes and Internally Geared Hubs page 1-3).

PARTS LIST FOR SHIFTERS AND CABLES NOT HERE. IS IT ELSEWHERE?

END OF 2ND FAX TRANSMISSION





# INTERNAL MULTI-SPEED HUBS

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Wheel frame  
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165

## DISASSEMBLY INSTRUCTIONS FOR SHIMANO INTER•4 SPEED SG-4RM31 ROLLER BRAKE, SG-4C30 COASTER BRAKE

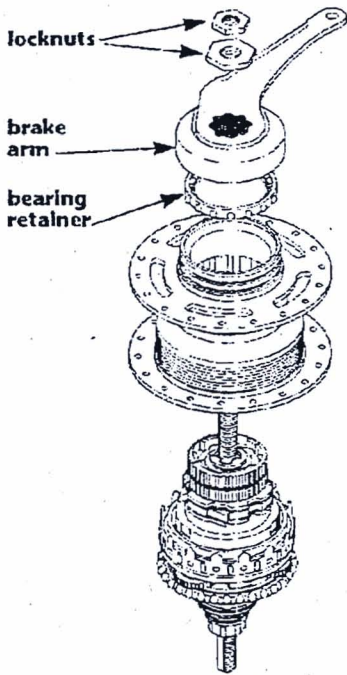
Instructions for both hubs are in this normal typeface. *Instructions for the roller brake hub only are in italics.* Instructions for the coaster brake hub only are in boldface.

Curly brackets { } indicate part for both hubs, parentheses ( ) indicate roller brake hub part, and square brackets [ ] indicate coaster brake hub part.

### 1 DISASSEMBLY

Clamp the axle (18) in a vise by the flats at its right end. You may leave the shifter mechanism and cable attached for troubleshooting purposes; but in this case, put the shift lever into first gear position when installing or removing parts.

*ROLLER:* Remove the brake unit fixing nut (24 or 25) and the brake unit from the left end of the axle (18). **CAUTION: The brake assembly is not intended to be disassembled, and may not function correctly once reassembled.**

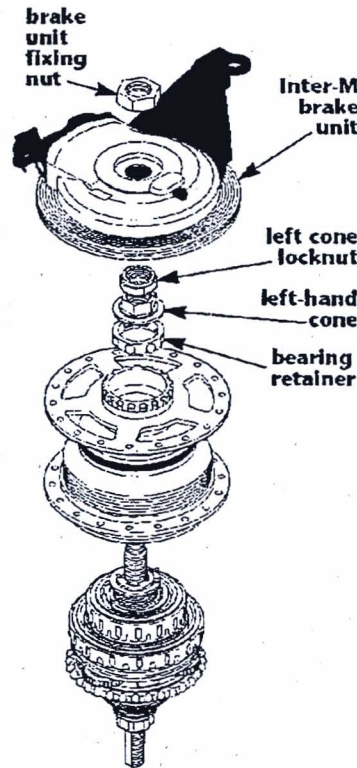


SG-4C30  
COASTER BRAKE

*Loosen the left cone locknut (38). Remove the locknut and cone (39) and bearing retainer (41) from the left end of the axle.*

**COASTER:** Using the special large Shimano 17mm and 22mm cone wrenches (part no. TL-7S20), loosen the locknuts [22], [23] from each other and remove them from the left end of the axle. Lift off the brake arm [26]. Remove the bearing retainer [40] from the brake arm or hub shell.

Rotate the hub shell counterclockwise while holding the sprocket from turning, and lift off the hub shell. If this does not free the internal roller clutch(es) and the shell will not lift off, remove the hub from the vise, turn it over and tap the left end of the axle on a hard surface to remove the hub shell. **CAUTION: If you pull up on the hub shell with the axle in the vise, the hub shell may release suddenly and strike you in the face.**



SG-4R31  
ROLLER BRAKE

## SUTHERLAND'S

TRAILING EDGE  
OF CAM

MAKE SURE TAB IS ON  
LEADING EDGE OF #42

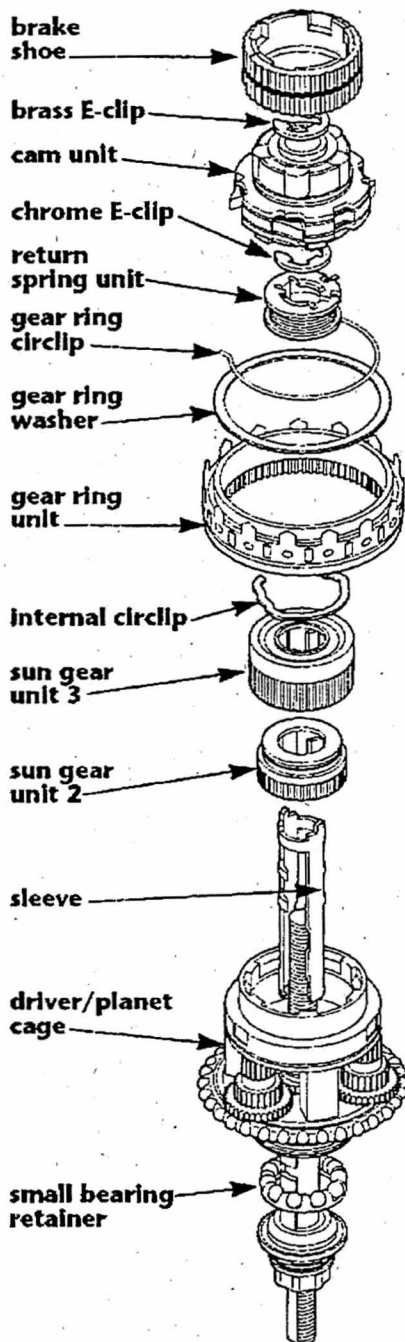
# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

### 2 DISASSEMBLY

Return the hub to the vise, as before.

**COASTER:** Remove the brake shoe [2]. Remove the brass-plated E-clip [3]. Remove the cam unit [4].



**SG-4C30  
COASTER BRAKE**

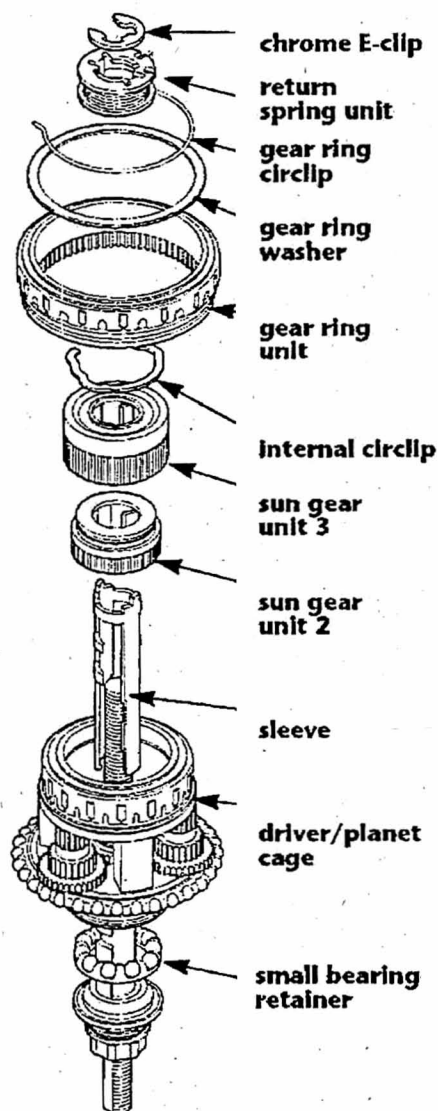
Remove the chrome-plated E-clip [5]. Remove the return spring assembly [6]. Remove the circlip [11 or 12] that secures the gear ring to the outside of the planet cage. This may be either of wire [11] or of flat steel stock [12].

**ROLLER:** This is the middle of three visible external circlips. **CAUTION: Do not remove the circlip that secures the large roller clutch assembly to the gear ring or the circlip that secures the smaller roller clutch assembly to the driver/planet cage.**

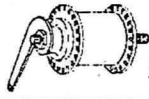
Remove the washer [13], if so equipped (only on hubs with wire circlip). Remove the gear ring/roller cam assembly [14]. Remove the internal circlip [8] from the inside of the driver/planet cage assembly [15 or 16].

Remove the driver/planet cage assembly [15 or 16] while rotating it backwards. If necessary, gently push the left [9] and middle [10] sun gear units (inside the planet cage) upwards first to release the driver/planet cage. You may reach the sun gear units with a screwdriver blade inserted between the planet pinions.

Remove the sleeve [7] from the axle. Remove the small bearing retainer [17]. **CAUTION: Do not further disassemble the axle.**



**SG-4R31  
ROLLER BRAKE**



# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

### 3 DISASSEMBLY

If you have not done so already, remove the sprocket circlip {46}, sprocket {45}, outer dustcap {44} and large plastic inner dustcap {43}.

Stand the assembly on its right (large) end. If you have not done this already, remove the internal clip {8} in the left end of the driver/planet cage {15 or 16}, then remove the left {9} and middle {10} sun gears through the left end of the planet cage.

## SUBDISASSEMBLIES

### Axle Driver/Planet Cage

➔ **CAUTION:** Shimano does not recommend that the driver/planet cage of the hub be disassembled. Its parts are not available separately. You may, however, remove the right sun gear, planet pinions and pinion pins for inspection and cleaning as follows.

Remove the flat circlip {16e} from the outside of the driver, under the large plastic dustcap {43}. Remove the wire circlip {16d} that is behind the groove for the flat circlip.

Holding the planet cage with its small end up, tap it on its small end to dislodge the pinion pins {16c}. Remove the planet pinions {16b}. Remove the small sun gear 1 {16f} assembly through the small end of the driver/planet cage. Remove the large bearing retainer {16a}.

*ROLLER:* Removing the circlip that secures the roller clutch assembly of the driver/planet cage is not recommended. The roller clutch assembly can be cleaned without disassembly. If you remove it, the small rollers can drop out and get lost. Though a generic item like bearing balls, rollers are much harder to obtain.

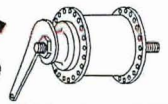
### Gear Ring

Disassembling the roller clutch assembly is not recommended; see comments on planet cage, above. The roller brake gear ring has an internal, circular spring; the coaster brake gear ring has no spring, as it is actuated by the friction spring inside the hub shell. The circlip in the coaster brake version is partially hidden under the roller cage.

# SUTHERLAND'S



# INTERNAL MULTI-SPEED HUBS



## SHIMANO INTER•4 SPEED (CONT'D) SUBDISASSEMBLIES (cont'd)

### Hub Shell - Coaster Brake

COASTER: You may remove the internal friction wire spring [26]. It is available as a replacement part.

### Cleaning

Clean all parts, including outside of hub shell, in a suitable solvent. Be very careful not to introduce dirt or grit after cleaning.

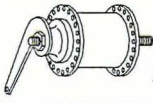
### Points to Check

[Parts numbers refer to Shimano parts list]

1. Pawls inside sun gears (9, 10, 16) and on outside of cam unit [4] (COASTER only) for wear or chipping..
2. Pawl springs: inside sun gears (9, 10, 16) and on outside of cam unit [4] (COASTER only) for shape and tension.
3. Ratchets: in hub shell (COASTER only) and on axle (13) [16] for chipped or rounded edges.
4. Gear teeth of sun gear units (6, 7, 11) [9, 10, 16], of planet pinions in driver/planet cage (15 or 16) and of gear ring (14) — for wear and chipping.
5. Return spring [6]; E-clip(s) (2) [3, 5], circlips (8) [11]; flat or and wire circlips on outside of driver/planet cage (15 or 16) circular spring inside hub shell (COASTER only) (4) and sprocket circlip (46) for shape and tension.
6. Bearing balls, rollers and races of brake cam unit [4], gear ring (14), driver/planet cage assembly (15 or 16) axle (18), brake arm (26) (COASTER only), left cone (39) (ROLLER only) and hub shell for wear and pitting.
7. Dustcaps, ball cages (17, 40, 41) (5, 24) and axle 18 for straightness.
8. All threaded parts for damaged or stripped threads.
9. Brake shoes (2) [2] and hub shell for roller brake assembly shell (27 or 28) for wear or glazing.
10. Roller clutch assembly of gear ring and of driver/planet cage (ROLLER only) for free movement and for inward and outward motion of the rollers. ROLLER: Both roller clutch assemblies have internal springs. Check for light but positive spring force holding the clutch rotated clockwise (as seen from left end) so the roller circle is expanded outward. COASTER: The roller clutch assembly of the gear ring does not have an internal spring and should rotate freely between its limits of travel.

ALL SET OF NUMBERS IN COORDINATE LISTS.

ALMOST NONE OF THESE #S MATCH PART LIST



# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

### Lubrication

Lubricate with oil all moving parts into which grease will not quickly penetrate. Lubricate pinion pins by dripping a few drops of oil on their exposed ends. If you have removed the pinion pins, you may also smear grease into the relieved sections near their center. Lubricate pawl springs lightly with oil. Lubricate shifter springs, pawls and rotating parts at right end of sleeve of axle-driver assembly lightly with oil. Use a good cycle oil. WD-40 is too light for lasting lubrication. 3-in-1 oil gums up with age.

Lubricate ball retainers by filling the spaces between the balls with grease. **COASTER:** Lubricate hub shell, brake shoes (inside and out), axle assembly and pinion teeth liberally with a high-temperature grease such as Shimano 7-speed hub grease, part no. 041 3011. **ROLLER:** you may use any good grease inside the hub. The Inter-M brake should be greased occasionally, or whenever it squeals or grabs. Use special roller-cam brake grease. There is a grease port in the brake cover plate.

*before reassembling driver/planet cage?*

## ASSEMBLY INSTRUCTIONS FOR SHIMANO INTER•4 SPEED SUBDISASSEMBLIES

### Hub Shell - Coaster Brake

**COASTER:** Install the internal spring (26) with its angled end clockwise, looking into the large (right) end of the hub.

### Cam Unit - Coaster Brake

**COASTER:** Reinstall the pawls and reassemble the pawl springs in their slots with their right-angled ends in the notches provided for them and oriented toward the central land between the springs. Each spring works two pawls 180 degrees apart, and the ends of the two springs should also be 180 degrees apart (not in the same notch). If you have disassembled them. Assemble the inner and outer cam unit bodies; reinstall the rollers, flat washer and roller circlip. Make sure that the friction spring is properly positioned and tensioned (rotates easily clockwise but is hard to rotate counterclockwise, looking at the cam unit from the roller end).

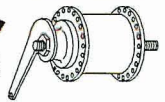
### Axle Assembly

To reassemble, follow (generally) the instructions for the 7-speed hub axle assembly, (*see page 16-48*). Keep the parts in order; some are different from those for the 7-speed hub.

SUTHERLAND'S



# INTERNAL MULTI-SPEED HUBS



## SHIMANO INTER•4 SPEED (CONT'D)

### Gear Ring

**If you have disassembled the roller clutch from the gear ring despite all the warnings:**

*ROLLER: reassembly instructions are the same as for the driver/planet cage roller clutch (see <sup>below</sup> above.)*

**COASTER: reassembly instructions are similar except that there is no internal spring. The smooth side of this roller cage faces downward and the toothed edge, upward. You must push the circlip down into position under the toothed edge of the roller cage.**

### Axle Driver/Planet Cage

**NOTE: the driver/planet cage is sold as a unit with the right sun gear assembly, planet pinion, pinion pins, and, in the roller brake version, the external roller clutch.**

Reinstall the large bearing retainer (16a) flat side up. Insert the smallest sun gear (16c) into the driver/planet cage (15 or 16) toothed end up. Reinstall the large bearing retainer (16a) flat side up.

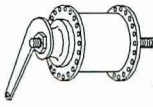
Reinstall the pinions (16b) and pinion pins (16e). Note: ~~it is easier~~ may be easiest to do this with the driver/planet cage installed on the axle to center the installed sun gear. The planet pinions must be timed. There is a dimple on the left (center-facing) side of the largest gear of the pinion. Install so the dimples of all three pinions face directly outwards at the same time while the teeth of the gear engage the sun pinion. (Caution: failure to time the pinions will result in rough operation and will damage the hub.) *← Boldface*

Replace the wire circlip (16d) on the outside of the driver to secure the pinion pins. Replace the flat circlip (16e) into its groove to the right of the wire circlip.

**ROLLER: If you have disassembled the roller clutch (roller brake version only) from the planet cage despite all the warnings: Secure the rollers in position in the roller cage with grease. Do not obscure the small hole at the inside of the roller cage (between the rollers and where the cage bends over at its smooth end). With the driver/planet cage resting on its large end, align the circular spring with its inward-facing tip at its clockwise end. Reinstall the inward-facing tip into the small hole in the driver/planet cage, just above the roller inclines.**

*Align the roller cage with its smooth end upwards. Install the outward tab of the circular spring into the small hole inside the roller cage above the rollers. Rotate the roller cage as far clockwise as possible, while easing the roller cage down over the driver/planet cage. Position the roller cage end of the spring under the driver/planet cage end of the spring. The spring must rest entirely below the circlip groove and above the rollers. The cage should smoothly rotate a few degrees counterclockwise against spring resistance as the spring and the circle of rollers both contract. Reinstall the circlip and test again for smooth operation.*





# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

Instructions for the roller-brake hub only are in italics. Instructions for the coaster brake hub only are in boldface. Instructions for both hubs are in this normal typeface. ( ) indicates Roller Brake Hub SG-4R31 part. [ ] indicates Coaster Brake Hub SG-4C30 part.

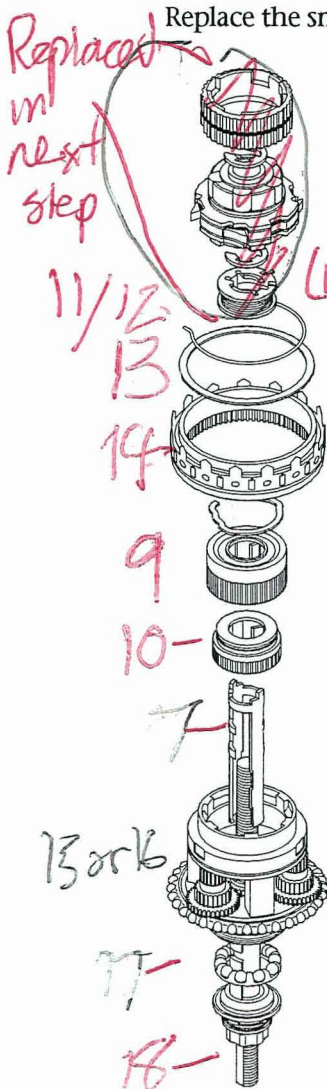
*Why is this not on preceding page - Has been rewritten - see part 2*

### 1 ASSEMBLY

**NOTE:** If assembling with the shift lever and cable attached for troubleshooting purposes, place the shift lever in first gear position. Otherwise, you may not be able to seat some of the internal parts assemblies, and you may force some pawls out of position.

Chuck the axle (18) in a vise by the flats at its right end.

Replace the small bearing retainer (15) on the axle flat side up.

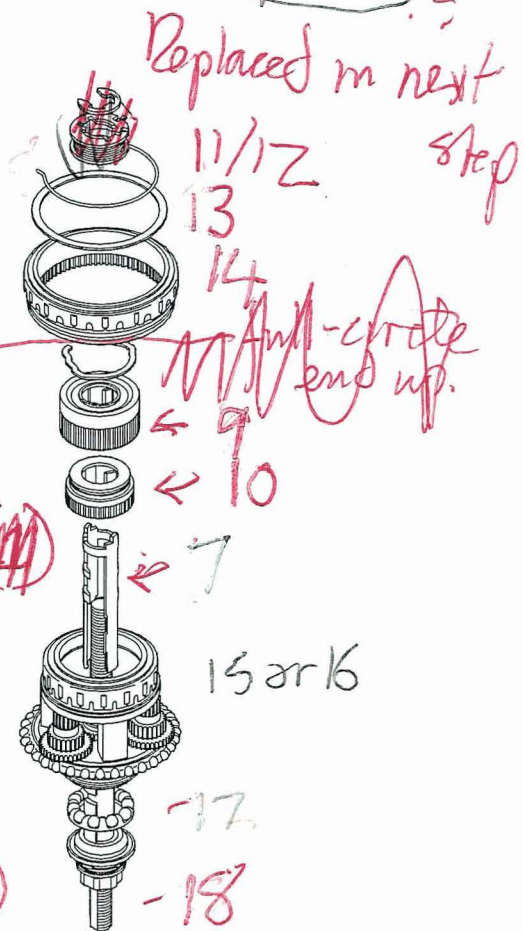


Replace the sleeve (7) on the axle (16). Note that the sleeve will go on two ways but there is only one way that is correct. This is the way which takes it farthest onto the the axle.

Replace the driver/planet cage assembly (114) large end down. Rotate it clockwise looking from the left end of the axle. Turn driver/planet cage assembly slightly back and forth to engage teeth of pinions with teeth of ring gear unit 1. After installation, rotate the driver/planet cage assembly forward (counter-clockwise) and check that both of the axle pawls inside sun gear 1 are ratcheting correctly.

Replace the sleeve (7) on the axle (18) full-circle end up. Rotate the cassette joint (at the sprocket end of the axle) as necessary to seat the sleeve. *When the sleeve is fully seated it will rotate along with the cassette joint and its left end will be about 3 mm (1/8 inch) below the rightmost circlip groove on the axle.*

Replace the medium-sized sun gear assembly (710) [10], teeth down. Ease it into place while rotating the planet cage back and forth, holding the pinions so they will not turn. Rotate, lift and lower the sleeve as necessary to help lower the sun gear. You may have to press down lightly on the sun gear with a screwdriver tip inserted between the pinions. When you are done, the teeth of the sun gear should engage fully with the middle teeth of the pinions.



### SG-4R31 ROLLER BRAKE

*When the sleeve is fully seated it will rotate along with the cassette joint and its left end will be about 3 mm below rightmost circlip groove of axle*


### SG-4C30 COASTER BRAKE


## SUTHERLAND'S

# INTERNAL MULTI-SPEED HUBS


## SHIMANO INTER•4 SPEED (CONT'D)

### 1 ASSEMBLY (cont'd)

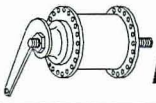
Replace the largest sun gear assembly  [9], toothed end down, notched flange side up. It should rest below the lower locking groove inside the driver/planet cage on the axle. If it does not, reposition the axle sleeve until you can ease the sun gear into place.

Replace the gear ring and roller clutch cam assembly  [14]. Test for smooth gear operation by rotating the gear ring backwards.

Replace the large flat washer  [13] if the hub is equipped with one.

Replace the circlip  [11 or 12] if there is no large flat washer, the circlip will be formed from flat spring steel. If there is a large flat washer, this will be a round round wire circlip. Place the angled end counterclockwise, looking from the left end of the hub axle. ~~If there is no large flat washer, the circlip will be formed from flat spring steel.~~





# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

### 2 ASSEMBLY

Replace the return spring assembly [6], flat, notched side up. It must slide over the end of the sleeve until its top surface is just below the lockring groove of the axle. Rotate the cassette joint if necessary, to align the axle sleeve with the return spring assembly.

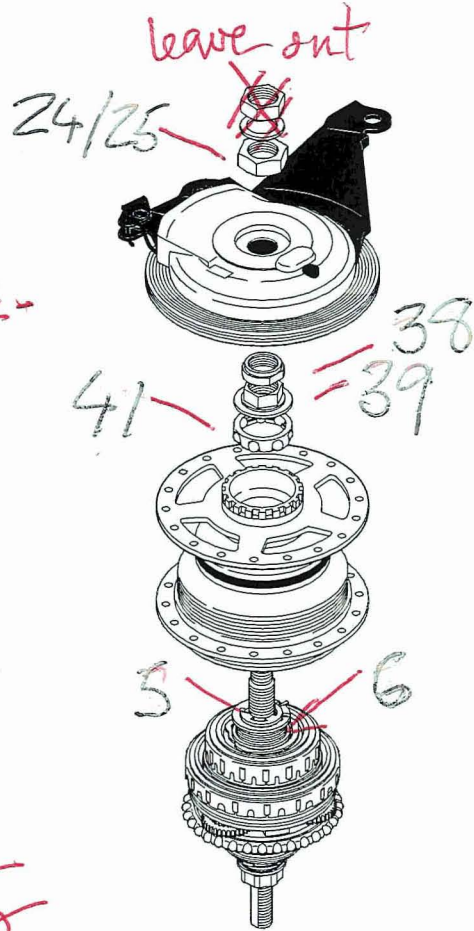
Replace the chrome-plated E-clip [5] (9.6 mm ID), **NOTE: it is slightly larger than the brass-plated E-clip used in the coaster brake version. A 3/8 inch E-clip will also work).**

**COASTER:** Replace the cam assembly [4], with the notched pointed tabs facing ~~down~~ the left end of the hub. Replace the brass-plated circlip [3]. Expand the brake shoe unit [2], over the cam unit four-notch side up. Then install the brake shoe. The gap at the underside of the brake shoe must fit over the right-angled end of the friction spring of the cam assembly.

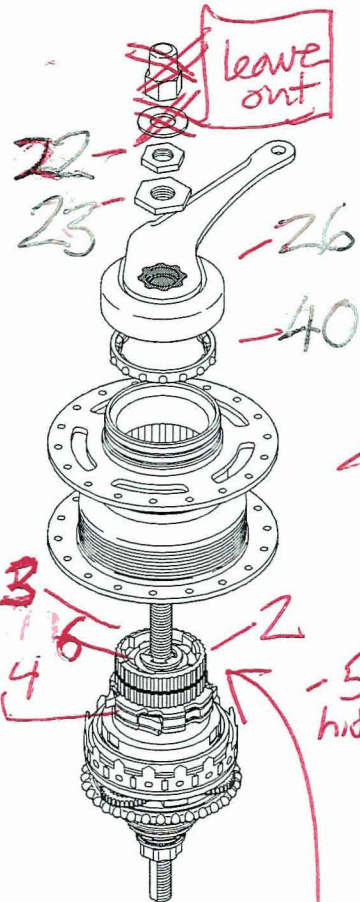
Lower the hub shell over the assembly until its lower face contacts the large bearing retainer of the driver/planet cage (150416). Then turn the hub shell slightly both ways to the left and right to help it seat into position the pawls engage. Turn the hub shell counterclockwise to check that it turns smoothly.

Install the bearing retainer [4] into its race in the hub shell, flat side up.

**COASTER:** Reinstall the brake arm unit [26] turning it to the right and left until the notches of the brake shoe unit [2] engage with the tabs of the brake arm unit. Install the large locknut [23] flange side down. Install the smaller locknut [22] and tighten it against the larger locknut [23]. Do not tighten the larger locknut against the brake arm [26]. Leave it just short of binding against the brake arm. This is the bearing adjustment for the hub. Adjust bearings so hub shell can be turned freely, but without bearing play, and tighten nuts against each other using Shimano 22 mm and 17 mm cone wrenches TL-7S20.



SG-4R31 ROLLER BRAKE



SG-4C30 COASTER BRAKE

Unclear, show brake shoe elevated so it does not obscure return springs, cam assy.

SUTHERLAND'S

# INTERNAL MULTI-SPEED HUBS

## SHIMANO INTER•4 SPEED (CONT'D)

### 2 ASSEMBLY (cont'd)

ROLLER: Reinstall the left cone <sup>239</sup> Install the locknut <sup>25</sup> and tighten it against the left cone <sup>239</sup>.  
 Leave the cone just short of binding against the ball retainer. This is the bearing adjustment for the hub.

Install the brake assembly <sup>270 or 283</sup> at the left end of the hub, so its splines engage those of the hub shell.  
 Install the brake arm fixing nut <sup>225</sup>. Do not overtighten it, as you may have to loosen it when installing the hub to the bicycle.

## GEAR TABLE FOR INTERNALLY GEARED HUBS

Multiply by gear value obtained from chainwheel and rear sprocket gear charts.

Gear	1	2	3	4	5	6	7
<b>Sachs</b>							
2-speed	1.00	1.36					
3-speed	0.73	1.00	1.36				
5-speed	0.50	0.78	1.00	1.29	1.50		
7-speed	0.59	0.67	.81	1.00	1.24	1.48	1.69
<b>Shimano</b>							
3-speed	0.75	1.00	1.33				
4-speed	1.00	1.24	1.5	1.84			
7-speed	0.63	0.74	0.84	0.99	1.14	1.33	1.55
<b>Sturmey Archer</b>							
3-speed	0.75	1.00	1.33				
4-speed	0.67	0.79	1.00	1.27			
5-speed	0.67	0.79	1.00	1.27	1.50		

All should be  
 to 2 decimal  
 places, even  
 when ending  
 in 0.