Technical Bulletin #21

SunTour U.S.A., Inc. 2 Cranberry Road Parsippany, N.J. 07054

Installation, Servicing and Troubleshooting Guide for ACCUSHIFT Indexed Shifting Systems

Section I: OVERVIEW

Certain components and dimensions are **a prerequisite** for **AccuShift** to function in Index mode. Without them, **AccuShift** and **Power AccuShift** are difficult or impossible to install and adjust.

Certain other components and dimensions are **strongly recommended.** Without them, quick adjustment and reliable performance of these systems cannot be guaranteed.

Attempting substitutions for any of these components may meet with frustration. The resulting shifting performance can range from downright useless to functional but tempermental. The best rule is to avoid the temptation to use components that are not **AccuShift** compatible. Substitutions invite problems; problems require time and labor to solve; time and labor cost money. So, to maximize profits and minimize headaches, avoid substitutions.

Section II: WHAT YOU'LL NEED

A. Required Components -- System won't work without them:

* **Shift Levers:** There are three classes of **AccuShift** levers:
    1. **"IC"** levers, (Indexed Control)
    2. **"IFC"** levers (Indexed Friction Control)
    3. **"IPC"** levers (Indexed Power Control), also referred to as **"Power AccuShift."**

"IC" levers mount on the handlebars only, and will shift **α**-3000 rear derailleurs with **AccuShift** compatible regular spaced 5 and 6 speed freewheels. These levers operate in the "index" mode only, and cannot be made non-indexing. They are indexed for the **α**-3000 series derailleurs only, and are not compatible with the rest of the **AccuShift** derailleur line.

"IFC" levers have two modes of operation: "Index" mode, for shifting **AccuShift** compatible regular spaced 5 and 6 speed freewheels; and "Friction" mode, for non-indexed shifting. Both handlebar and downtube mounting models are offered.

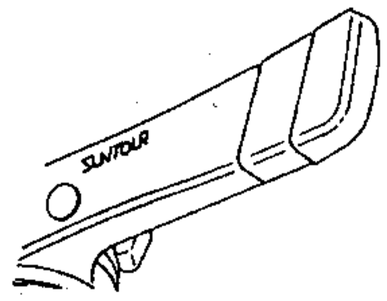
IFC levers are available indexed for the **α-3000** series rear derailleurs, in which case they are labled "FOR α-3000 DERAILLEUR ONLY"; or with indexing that is compatible with all of the other **AccuShift** derailleurs.

The IFC thumbshifters' "Index" mode has been designed with an extra amount of free play, or "lash", in the lever movement. Designed to compensate for the rapid chain wear on mountain bikes, the lash allows the rear derailleur to overshoot a small amount when shifting from outboard to inboard cogs. This feature requires that pressure be maintained on the shift lever until the chain moves to the desired inboard cog. While the technique may seem odd initially, once acquired, its use will maintain peak performance in index mode longer as the chain wears.

Typically, a properly adjusted **AccuShift** mountain bike drivetrain with a fresh chain will not require taking advantage of this extra lash during a shift from a smaller (outboard) ta a larger (inboard) cog.

"IPC" Power **AccuShift** levers are unique because they have three modes of operation: one is indexed for **AccuShift** compatible regularly spaced 5 and 6 speed freewheels; another is indexed for **AccuShift** compatible narrow-spaced Ultra-7 speed freewheels; and the third is non-indexed and features SunTour's patented "Power Ratchet" mechanism. The "Power" mode can be used with <u>any</u> freewheel, regardless of make or cog spacing.

These versatile Index Power Controls are currently available for downtube mounting only, and can be identified by the inlaid non-slip gripping surface on the levers.



*** Rear Derailleur:** Any SunTour rear derailleur with a 4 digit number following its name (**Sprint 9000; XC Sport 7000; α-5000;** etc.) can be used with any SunTour **AccuShift** or Power **AccuShift** control levers. So can the 1987 Superbe Pro derailleur, which can be identified by the stainless steel cable trim barrel which is an integral part of all AccuShift rear derailleurs. The one exception is the **α-3000** rear derailleur, which will only work with **α-3000** labeled shift levers.

Since **AccuShift** required modifications to SunTour's original rear derailleur geometry, earlier SunTour rear derailleurs, or current

models without a 4 digit number after their name (except the '87 **Superbe Pro**), cannot be retrofitted into an **AccuShift** system.

Any **AccuShift** or Power **AccuShift** control lever can be used with any **AccuShift** rear derailleur, whether for off- or on-road bikes. There is complete interchangability, **with the single exception of the a-3000 levers and rear derailleur.** The a-3000 rear derailleur incorporates a special, spring-loaded cable anchor clamp, which was deemed to be a desirable feature on an entry-level indexed shifting system. Because this feature changes the derailleur geometry, a special index lever, always labled **a-3000**, is required.

Compatible	SUPERBE PRO
	Sprint 9000
	XC 9000
	CYCLONE 7000
	XCSPORT 7000
	α-5000
Exception	α-3000

*** Freewheel:** Traditional non-indexed shifting systems use freewheels in which the distance getween individual cogs is controlled to a tolerance of +/- 0.3mm. To be "**AccuShift** compatible", on the other hand, a freewheel has to be assembled so that the spacing between individual cogs does not vary by more than +/- 0.05mm.

All SunTour **Winner** and **Winner Pro** regular 5 and 6 speed freewheels can be used with <u>any</u> SunTour **AccuShift** product. Winner and Winner Pro Ultra-7 freehweels may be used with SunTour **Power AccuShift** "IPC" levers and all but the **a-3000** rear derailleurs. **No Ultra-6 freewheels of any type will work effectively with any AccuShift or Power AccuShift system shift lever**, because the spacing between each cog on an Ultra-6 freewheel is slightly different from that of an Ultra-7.

In addition to the **Winner** and **Winner Pro** freewheels, **SunTour a** freewheels may also be used with any **AccuShift** product. These freewheels are very similar to the older SunTour **Perfect** freewheels, except they are built to **AccuShift** tolerances. They can be identified by the **a** insignia on the freewheel name plate.

When checking for freewheel compatibility, the simple rule is: Any regular 5 or 6 speed freewheel which can be removed with the SunTour 4-prong freewheel removing tool (TA-320) is compatible with any **AccuShift** or **Power Accushift** control lever. Any Ultra-7 freewheel that is removable with the SunTour 4-prong remover is compatible with any **Power AccuShift** control lever.

B. Strongly Recommended Components:

*** Chain:** The chief interaction in any shift, whether indexed or non-indexed, is between the freewheel and the chain. The wrong chain/freewheel combination can make the best indexing system shift doubtfully, or make non-indexed shifting difficult. For this reason, particular attention must be paid to chain selection with **AccuShift** systems.

For index shifting, component manufacturers will usually refine a chain's design to perform optimally with their particular freewheel sprocket's tooth profile. Such a chain will usually perform flawlessly on that manufacturer's freewheel, but only adequately on another manufacturer's freewheel. For this reason, it is wise to stay with a freewheel manufacturer's recommended chains once the freewheel has been chosen.

Chains optimized for use on SunTour freewheels are the **SunTour Superbe Pro**, **Suntour Pro**, and **SunTourCyclone**. These chains may be used on either Ultra or regular spaced freewheels. HKK's new "Z" chain, their "Spirit" chain, and the DID "Lanner" chain may all be used for regular spaced freewheels only.

Chain selection becomes particularly important for larger block freewheels -- 13-26 and above. This is because the rear derailleur's guide pulley must at times be farther from the freewheel to accomodate the larger sprockets. This allows more free chain between the guide pulley and the freewheel, which magnifies the effects of a worn or poorly made chain.

Generally: an Ultra-7 freewheel requires a narrow chain; a regular spaced freewheel's performance is optimized by a wide chain with beveled or flared side plates.

*** Cables:** Cables must be chosen with two conflicting requirements in mind: They must not stretch; yet they must be thin enough to minimize friction inside the cable casing and at points of contact with the frame.

There are two basic types of cable currently available: "wound" and "braided" (sometimes called "double-wound"). A "wound" cable can be distinguished from a "braided" cable by examining the path of a single wire strand in the cable. In a wound cable, an individual strand follows a simple helix path from the head of the cable to its end. A braided cable is made of several groups of wound cables that are then wound about each other. Therefore, the path of an individual strand in a braided cable is longer and more complex than in a wound cable. Under load, each strand in a cable tries to straighten itself out. The longer path of a braided cable causes the cable to stretch a certain amount as each strand tries to straighten. In an indexed system like **AccuShift**, this stretch is unacceptable for all but the shortest cable lengths.

Heavier gauge wound cables are ideal for resisting stretch, but can cause extra drag in the casing, and particualrly at points of contact with the frame. For this reason, use of heavy gauge cables is not recommended.

SunTour has found that quality 1.2mm wound cables give the most reliable performance. In rare cases, where the quality of both the frame and components is high and the cable path is short (as on racing bikes), 1.5mm braided cable can be used; but any cable which feels rough or uneven when pulled between your fingers should be avoided.

The best general rule about cables is: when in doubt, use SunTour 1.2mm cables to save time and trouble.

*** Cable casing:** For **AccuShift** to work properly, the shift lever must precisely and predictably communicate with the rear derailleur through the cable and its casing. **The slightest amount of binding, stretching or flexing in the cable and/or casing can seriously interfere with the adjustment and performance of any indexing system.**

The requirements for casings, too, are contradictory. The casing must be rigid (resist flexing); yet must accomodate curves.

There are four basic types of casing currently available on the market: **standard wound, lined, compressionless,** and **laminated** casing.

Standard wound casing is made of a single wire wound into a tight coil. It may or may not have a plastic coating on the outside, and it has no coating or liner of any type inside the coil. This type of casing is unacceptable for use with **AccuShift**, because it causes relatively high drag on the cable, and because under load, each individual loop in its coil slips past the next by a small amount, creating "flex".

Lined casing is usually 6mm in diameter, so it is slightly larger than other types. Its construction is similar to standard wound casing, but a plastic tube (the "liner") has been inserted into the casing channel. This liner is not firmly attached to the inside of the casing, so all it does is reduce friction on the cable without necessarily making the casing any more rigid. It is not recommended for use with **AccuShift**.

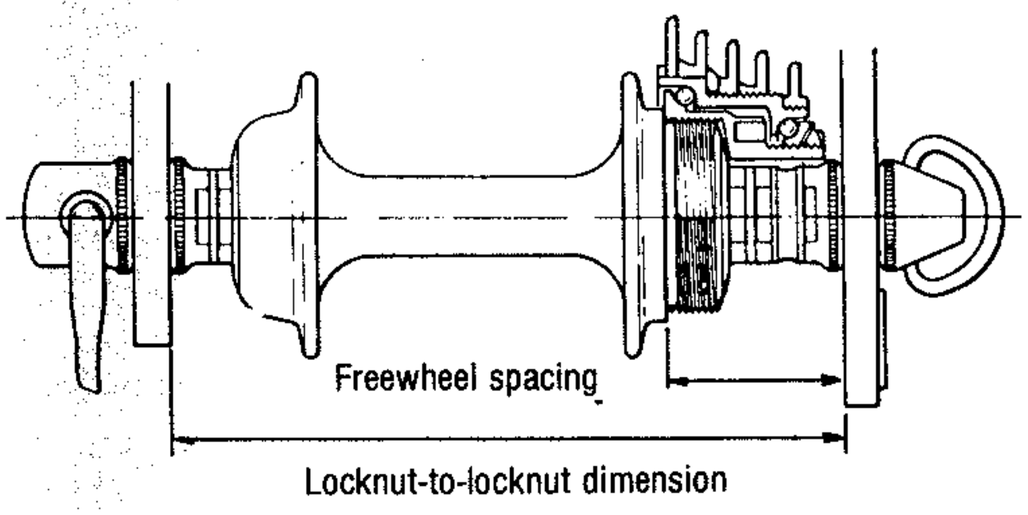
Compressionless casing is made from several strands of wire instead of just one. These strands are parallel to each other, and run the length of the casing. They usually have a captive liner inside, and a plastic coating outside. The main advantage of this type of casing is that it's the most rigid available; the main disadvantage is that it strongly resists bending. This disadvantage renders this type of casing useful only for <u>limited applications</u> with **AccuShift** systems: it can be used with some handlebar/thumbshifter arrangements, where it will be required to

bend only slightly between the thumbshifter and the downtube casing socket. But compressionless casing is unacceptable for use between the chainstay and the rear derailleur. With sharper bends, one or both ends of this casing may pull away slightly from the socket as the casing tries to straighten itself out. This gap closes when the cable comes under tension from normal shifting loads, causing play which will make the **AccuShift** system difficult or impossible to adjust.

Laminated casing is usually 5mm in diameter, and is very similar to lined casing, except that the liner is captive inside the coil. This casing is referred to as a "laminate" because each of its three layers -- inner liner, wire coil and outer plastic coating -- are mechanically connected to each other, and therefore each supports the other. The inner liner not only reduces drag on the cable, but it also provides stiffening support from the inside of the casing. This type of casing tolerates relatively tight radius curves without sacrifice to its rigidity. Therefore, **laminated cable casing is recommended for AccuShift.**

To prevent cable binding, **all casing ends must either have a metal cap, or be trimmed squarely** (see illustration). Grinding casing ends square is very important, because any pinching, binding or rocking of the cable in the cable socket will hinder index shifting performance. The best solution is a square cut, ground casing with a well-fitting metal end cap.

*** Hub Dimensions:** For **AccuShift** indexing to work effectively, the **freewheel's placement relative to the rear derailleur must be correct.** While rear derailleur placement is determined by the frame and rear dropout (discussed later), the freewheel's position is determined by the hub.



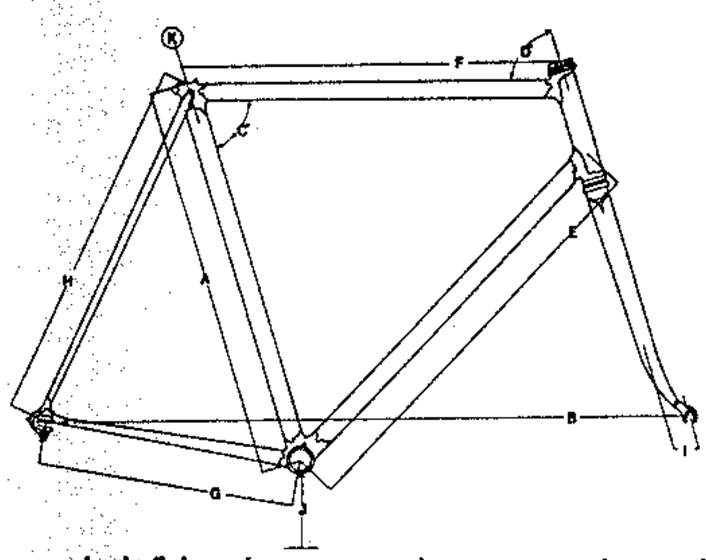
There are two critical hub dimensions hub: "locknut-to-locknut" and "shell offset".

The "locknut-to-locknut" dimension is measured from the outer face of one locknut to the outer face of the other. This is the distance that the frame's dropouts are separated by the hub. Commonly, this distance is 126mm, although several mountain bikes now use 130mm. For older frames, this distance may be 120mm, while some tandems use 140mm.

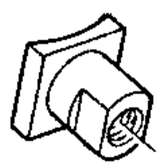
The hub's "shell offset" is the amount of space on the right side

of the hub allowed for the freewheel. This distance is measured from the base of the freewheel threading on the hub shell, to the outer face of the right side locknut. For **AccuShift, this distance must be 33mm for 5 speed freewheels, and 37mm for regular 6 speed and Ultra-7 speed freewheels.** Variance from these measurements by as little as 1mm can disrupt accushift adjustment and performance.

* **Frame Requirements:** Frame design is one of the major influences on shifting performance, but is often the least controllable. When building a frameset to be fitted with **AccuShift**, or when evaluating an existing frame for retro-fitting with an **AccuShift** system, use the following checkpoints:



1) The shift lever boss should be Campy pattern (see illustration). The "flats" of the stud should be parallel to the downtube.



2) Internal cable routing is generally not recommended, but may be acceptable if it meets the following criteria:

a) The cable must be supported along its entire length inside the frame tubes by steel tube guides, or some similar rigid material. Plastic tubing allows too much flex, so it is unacceptable.

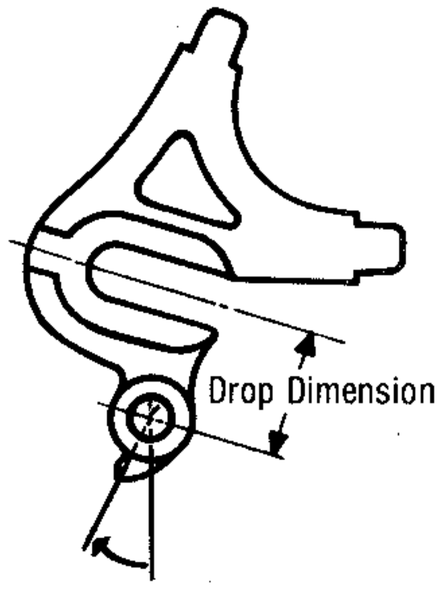
b) Cable entry into the frame tubes must be gradual, without forcing the cable through any small radius curves. Such curves increase cable binding and flex.

3) The bottom bracket cable guide can be a source of cable binding. The best location for this guide is above the bottom bracket shell. Guides mounted under the bottom bracket may be used, provided they are smooth and made of a relatively hard metal. (Generally, the metal of the bottom bracket shell itself is too soft and binds the cable.) Plastic cable guides mounted under the bottom bracket shell cause excessive drag on the cable, so they are not recommended. To test the acceptability of a given cable guide, lubricate the cable channel. If this produces a noticable improvement in the performance of the **AccuShift**, the guide is not acceptable, and lubricating it will be a temporary remedy at best. When possible to install, a clamp-on cable guide will cure this problem.

4) All frame-mounted cable casing sockets should be long enough to securely support the end of the casing and prevent it from

pivoting from side to side. The inner diameter of these sockets should closely match the outer diameter of the casing.

5) Rear dropout dimensions and alignment are absolutely critical to adjustment and performance of **AccuShift** (see diagram). The dropout positions the rear derailleur in relation to the freewheel, and this positioning **must be precise.** The acceptable drop dimension range is 24mm to 28mm, and the dropout tab must be at an angle to the perpendicular of between 30 and 35 degrees.



Section IV: INSTALLING AND SERVICING SUNTOUR ACCUSHIFT SYSTEMS

BEFORE YOU BEGIN:

A) Review the frame checklist to determine whether the frame is **AccuShift** compatible. Confirm that the rear derailleur hanger on the rear dropout is precisely aligned.

B) Confirm that the gearing to be used is within the rear derailleur's rated capacity. "Largest sprocket" capacity referrs to the maximum size freewheel cog the rear derailleur will accomodate; "total gear capacity" is the tooth difference between the largest and smallest freewheel cogs PLUS the tooth difference between the largest and smallest chainrings.

EXAMPLE: 13/30 freewheel; 52/42 chainrings:

30 - 13 = 17 ; 52 - 42 = 10

17 + 10 = 27t total gear capacity

A. INSTALLING AND ADJUSTING ACCUSHIFT AND POWER ACCUSHIFT CONTROL LEVERS

Power AccuShift Index Power Control Shift Levers Model SL-IP00

IMPORTANT NOTE: The goemetry of the α-3000 rear derailleur and shift levers varies slightly from the other SunTour indexed shifting systems. Therefore, Power AccuShift (IPC) levers cannot be used with the α-3000 rear derailleur.

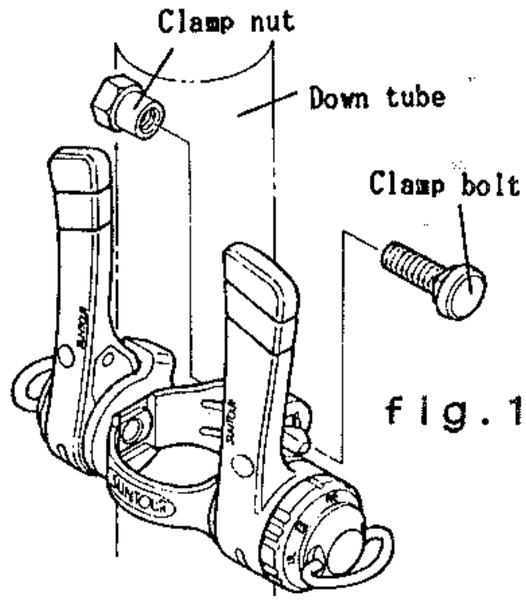


fig.1

1a. **For Clamp Mounting:** Install the clamp in position on the downtube, and tighten the clamp nut to a torque of 50-60 kgf.cm (fig. 1).

1b. **For Brazed-On Mounting:** Familiarize yourself with the parts of the Index Power Control levers by referring to figure 2.

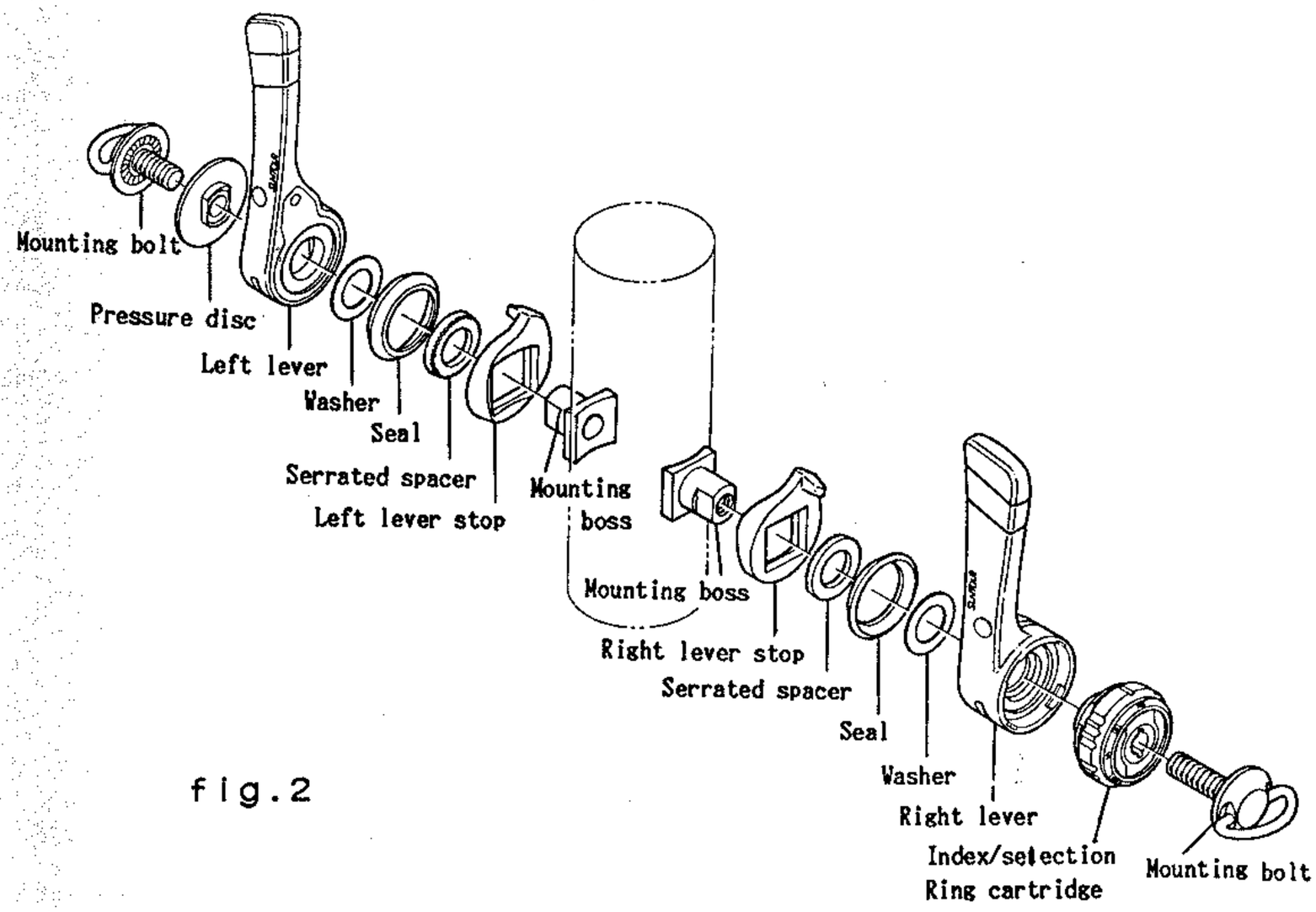


fig.2

WARNING:

A) Do not try to remove the ratchet mechanism from the shift lever, or try to disassemble it.

B) Do not disassemble the index mechanism and selection ring cartridge.

Disassembly of either unit voids the warranty.

2. Install the levers on to the mounting bosses with the parts in the sequence shown in figure 2. Note that the serrations on the brass spacer face the down-tube, and the dished plastic seal has its wide face toward the lever. The mounting bolts should be just tight enough for the levers to fit snuggly against the face of the lever stop.

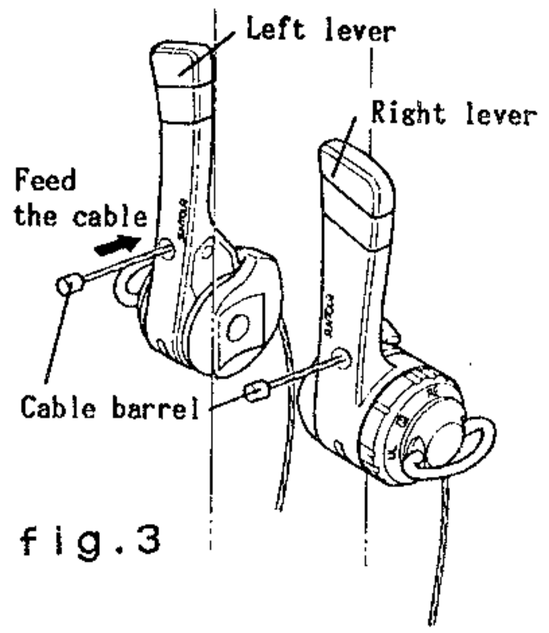


fig.3

3. Feed the cables as shown in figure 3, making sure that the cable barrels are fully seated in the cable barrel ports.

4. Select the shift mode for the right hand lever. The SunTour Index Power Control gives you three shifting options, which you select by turning the selector ring so that the red line lines up with your choice of shifting mode:

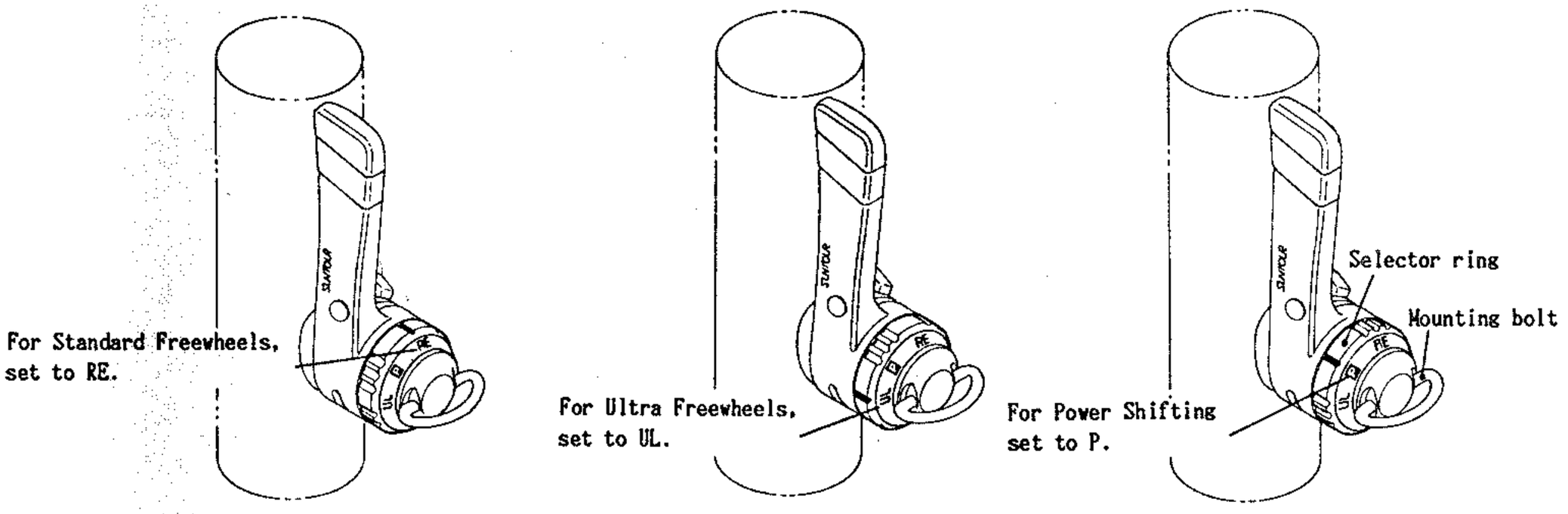


fig.4

RE is for indexed shifting with a standard spaced SunTour **Winner System** or **a** freewheel.

UL is for indexed shifting with an Ultra-7 (narrow spaced) SunTour **Winner System** 7-speed freewheel.

P is for non-indexed power shifting with any freewheel, regardless of sprocket spacing.

If the selector ring is hard to turn, loosen the mounting bolt one or two turns; then, after selecting the appropriate shifting mode, retighten it.

5. After you have clamped the shift cables into the front and rear derailleur cable clamps, adjust the mounting bolts to the minimum tension which keeps the derailleur in gear.

B. AccuShift Index Friction Control Shift Levers

Downtube Shifters: Models SL-CL10-B, SL-CL10-C, SL-5000-BS, SL-5000-CS, SL-3000-BS and SL-3000-CS

Thumb Shifters: Models SL-5000-CH and SL-3000-CH

Stem Shifters: Models SL-5000-CP and SL-3000-CP

IMPORTANT NOTE: The geometry of the a-3000 rear derailleur and shift levers varies slightly from the other SunTour indexed shifting systems. Therefore, the a-3000 shift levers and rear derailleur must be used together. Neither the derailleur nor the levers are interchangeable with the other SunTour AccuShift components.

1a. **For Clamp-on mounting:** Mount the lever as shown in fig. 1a (downtube mount); fig. 1b (handlebar mount); or fig. 1c (stem mount). Wrap the clamp around the downtube or handlebar, and tighten the clamp bolt to a torque of 50-60 kgf/cm.

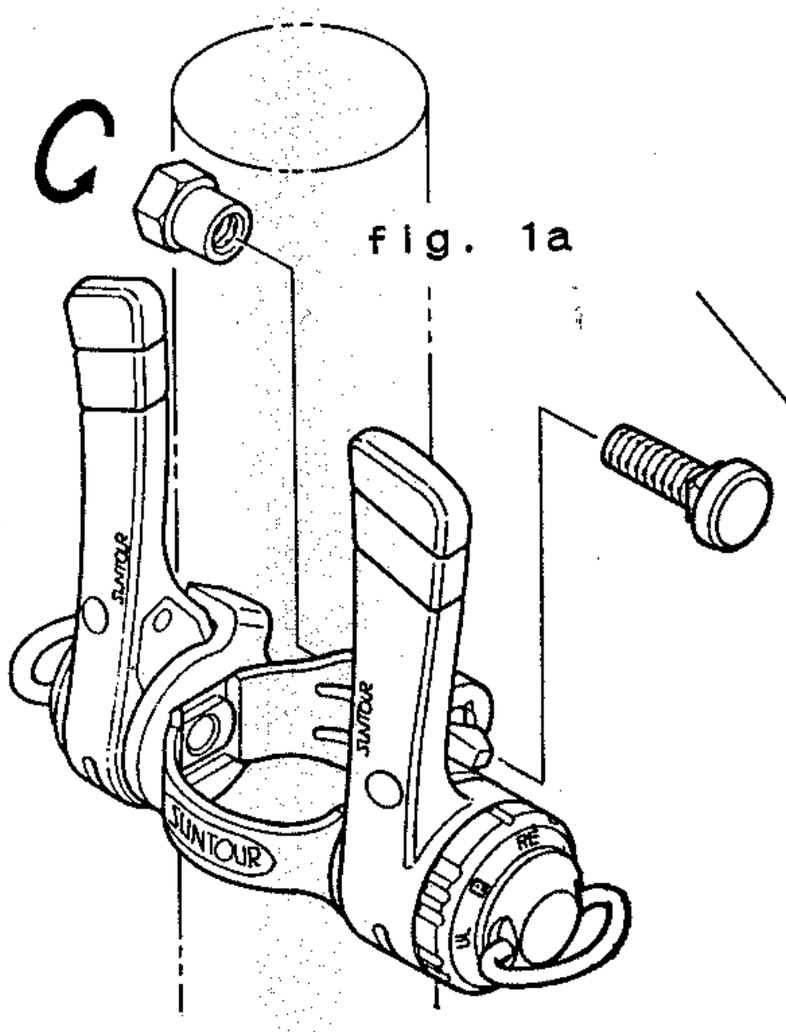


fig. 1a

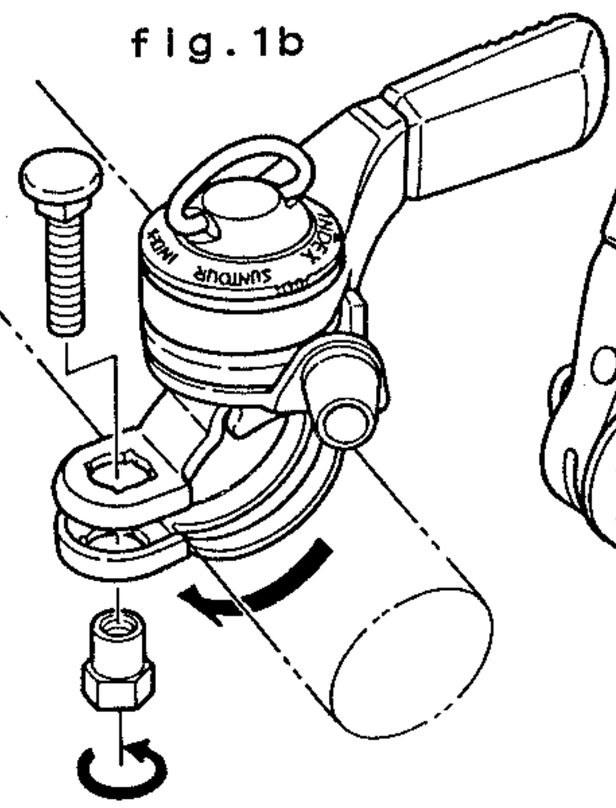


fig.1b

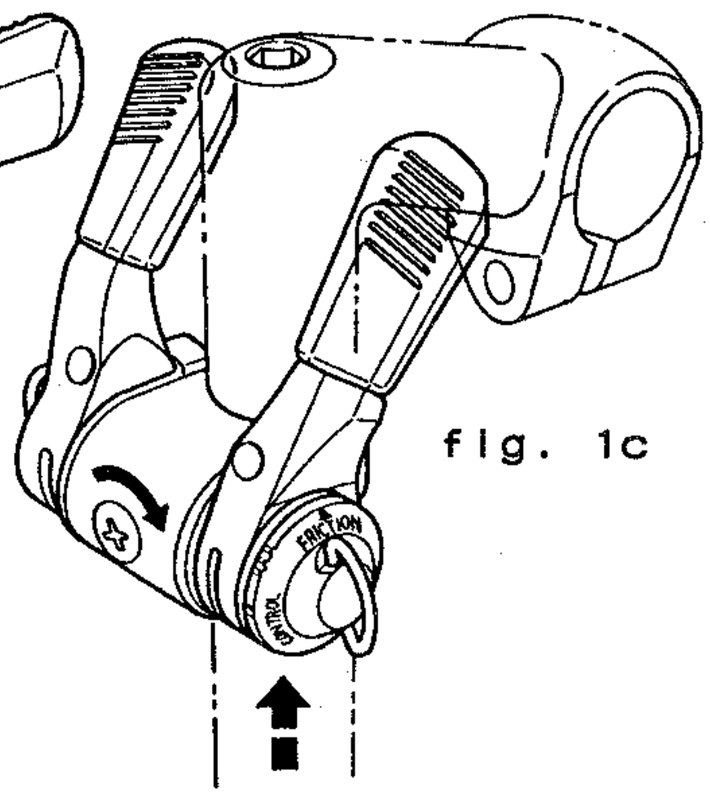


fig. 1c

1b. **For Braze-on mounting:** Fit the square recess of the shaft collar to the braze-on boss, and mount the shift levers without disassembling them (fig. 1d). Before fully tightening the right lever's mounting bolt, line up either the "FRICTION" or "INDEX" mode on the selector ring of the right shift lever with the red notch on the washer beneath the ring. Then tighten the mounting bolt. Appropriate tension is the minimum which will keep the lever from slipping out of gear.

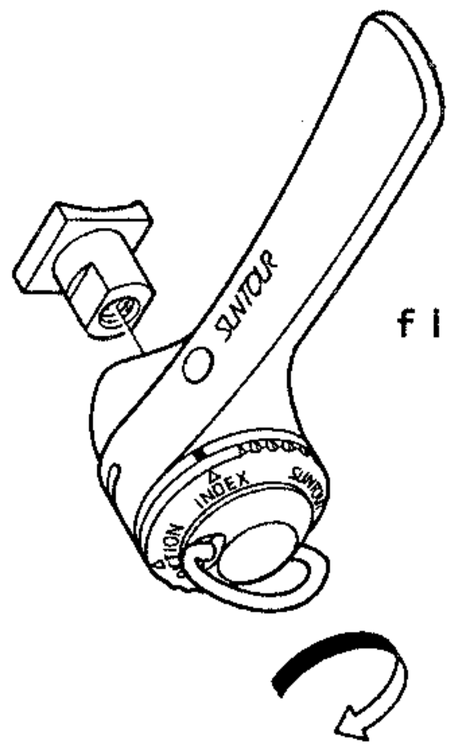


fig. 1d

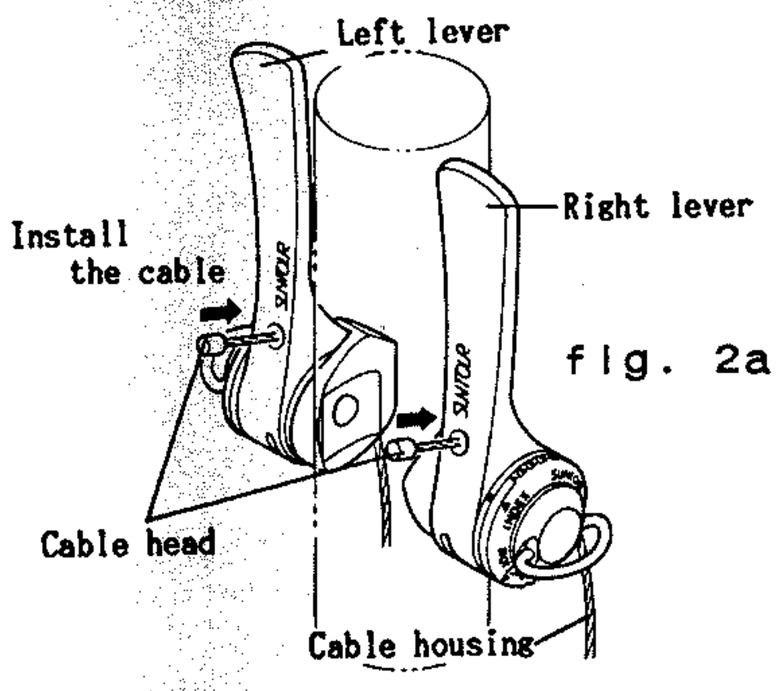


fig. 2a

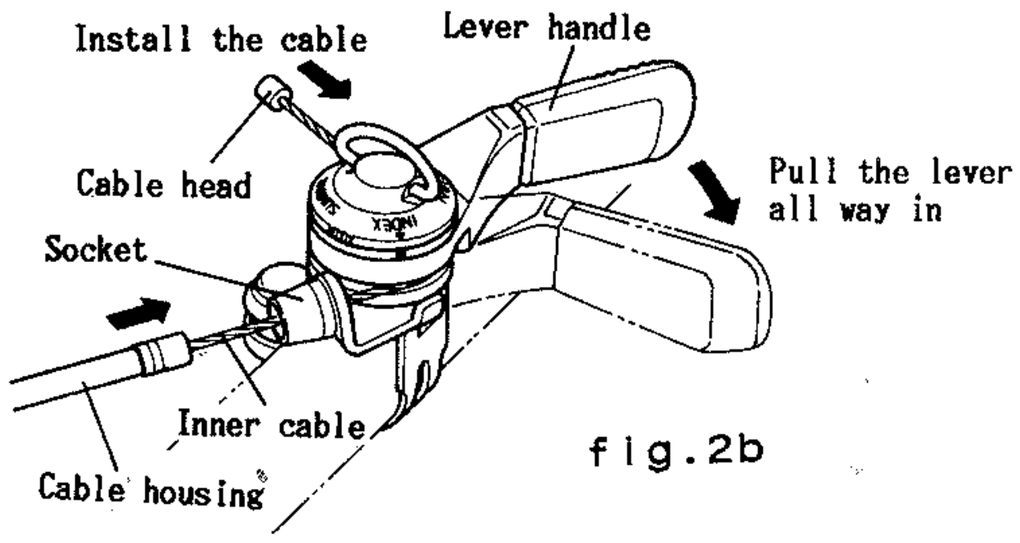


fig.2b

2. Install the cables as shown in fig. 2a or 2b. Be certain that the cable heads are well seated in the lever and all housing ends are trimmed, squared, and firmly seated in their sockets.

CAUTION: Failure to observe these details may cause too much slack in the cable system, adversly affecting the performance of the **AccuShift** system.

3. You can select either the indexed or the conventional shifting mode (fig. 3 & 4). To change the shifting mode, loosen the "D" ring mounting bolt no more than two turns, and turn the selector ring 90 degrees clockwise or counterclockwise until the appropriate arrow on the selector ring lines up with the red mark on the washer beneath it. Most people will prefer the index (**AccuShift**) mode.

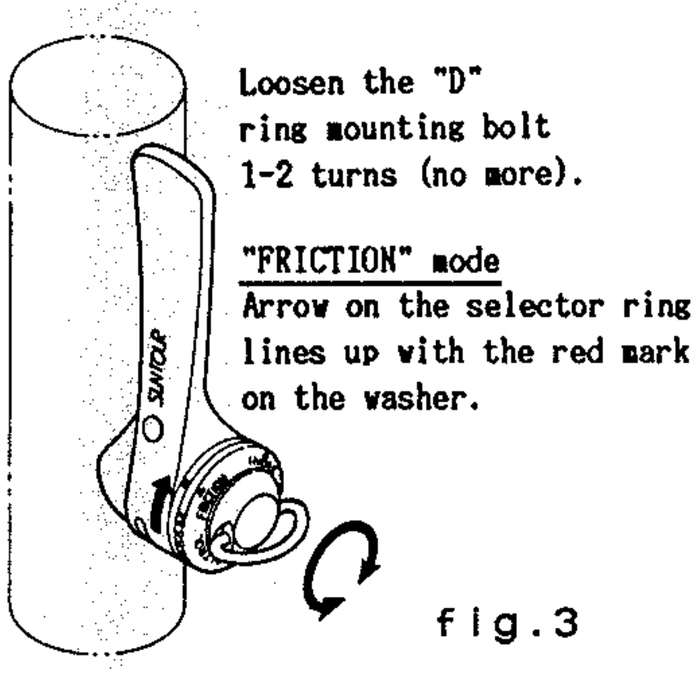


fig.3

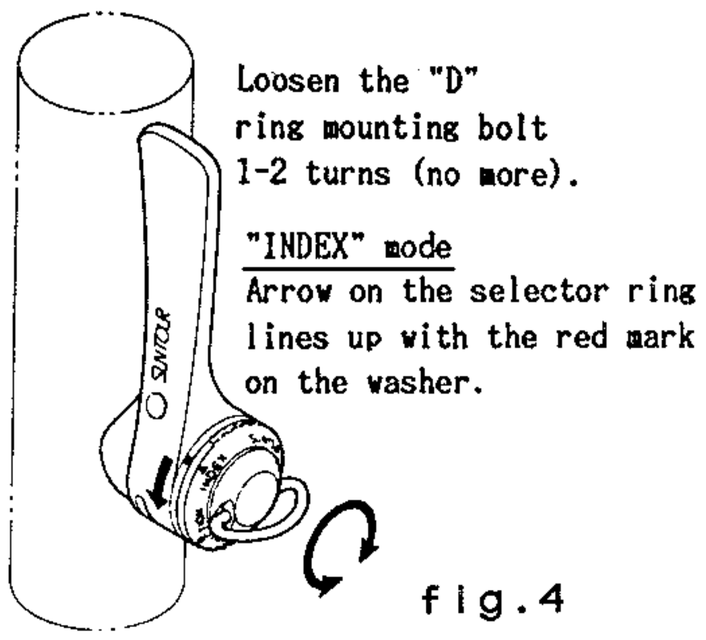


fig.4

C. INSTALLING AND ADJUSTING SUNTOUR ACCUSHIFT REAR DERAILLEURS

1. With a 5mm allen wrench, attach the rear derailleur to the frame so that the derailleur's spring retainer tab is just behind and up against the dropout's derailleur stop (fig. 5). (α-3000 rear derailleurs do not have a spring in the upper pivot, so they will not have this spring retainer tab). Tighten to a torque of 80-100 kgf/cm (fig. 6).

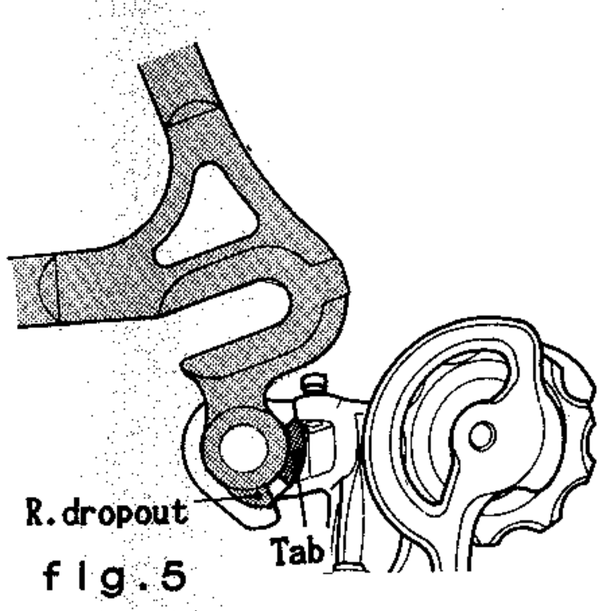


fig.5

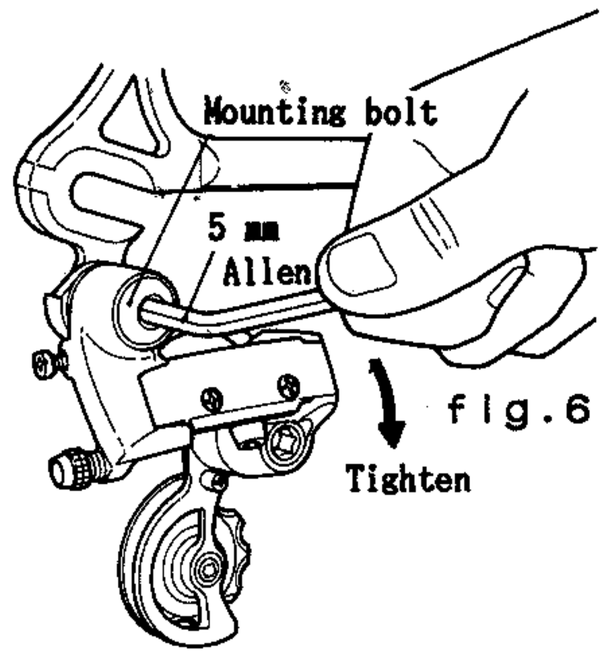
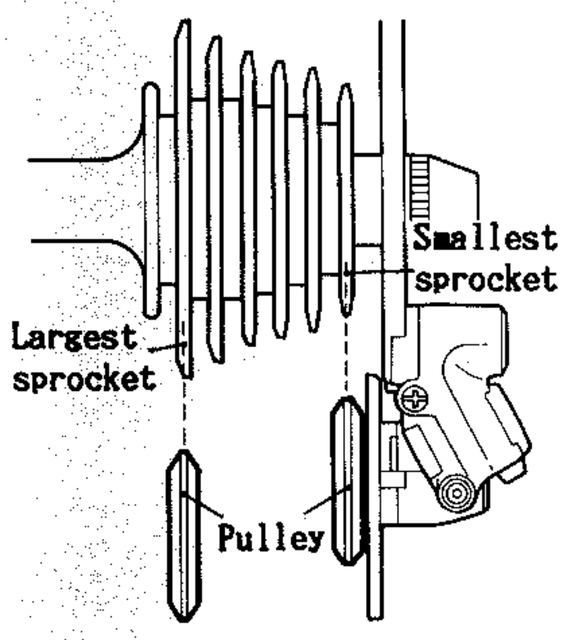


fig.6

2. Adjust the high gear limit screw (H) so that the guide pulley centers directly under the smallest freewheel cog (fig. 7). **This adjustment is critical, since the indexing is keyed to this guide pulley position.** Clockwise moves the pulley in; counterclockwise moves it out.



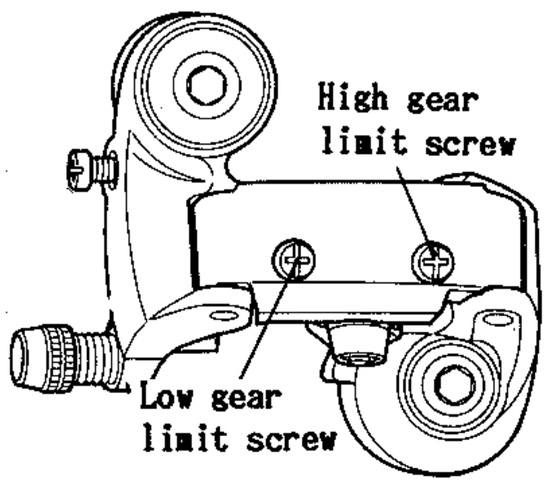


fig.7

3. If using SunTour Index Power Control (IPC) shift levers, set the right hand lever to the Power mode (P). If using Index Friction Control (IFC) levers, set the indicator arrow to Friction mode.

4. Push the right hand shift control lever all the way forward.

5. Turn the cable adjusting barrel at the rear of the derailleur (fig. 8) all the way in (clockwise).

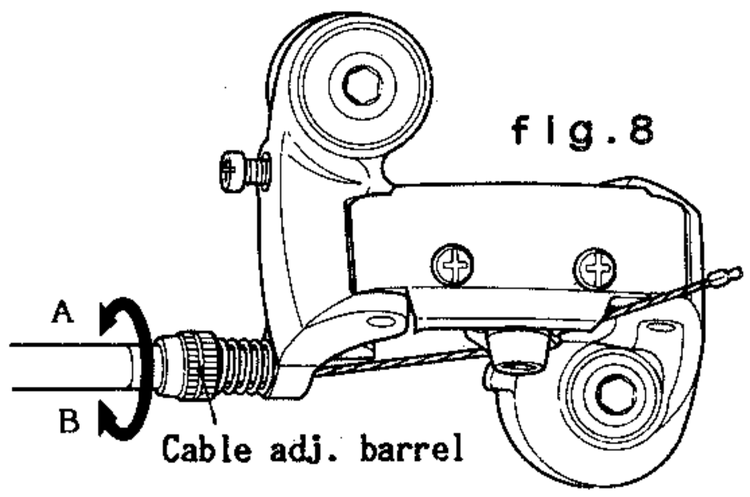


fig.8

6. Check all cable casing and confirm that it is the correct type, and the ends are either cleanly squared or capped, or both. Check shift cable to confirm it is the correct type. (Reference: "Cables" and "Cable Casing" in Section II B "Strongly Recommended Components"). Lubricate the inside of all cable casing with a light oil (grease is **not** acceptable). The lining inside the casing is not a substitute for lubrication.

7. Loosen the cable anchor bolt. Lead a new **AccuShift** compatible shifting control cable from the shift lever through the cable guides, cable casings, and the rear derailleur's cable adjusting barrel, into the cable anchor clamp. Pull the control cable tight, and tighten the cable anchor bolt to a torque of 40-50 kgf/cm. Cut the cable to length and cap it to prevent fraying (fig. 9).

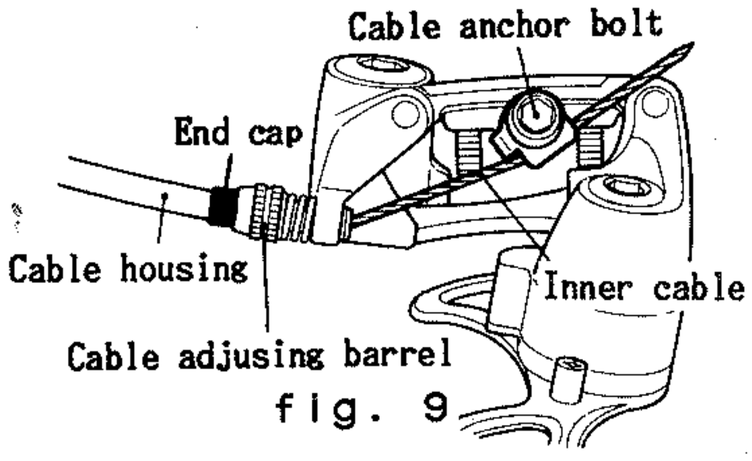


fig. 9

8. Confirm the chain is the correct length by shifting into highest gear (small freewheel cog & large chainring). Then, while holding the rear derailleur body **parallel** to the chainstay, locate the small dot on the pulley cage. (**α-3000** rear derailleurs use the cage pivot stop pin as reference instead of a dot.) If the chain is the correct length, this dot will line up with specific reference marks on the main body of the rear derailleur. These are:

Superbe Pro, Sprint-9000: two lines molded into the plastic bushing between the pulley cage and the main derailleur body (fig. 10a)

Cyclone-7000, XC-9000, XC Sport-7000, α-5000: a small notch in the alloy of the lower pivot spring housing (fig. 10b)

α-3000: a notch cut into the steel cage hanger tab (fig. 10c)

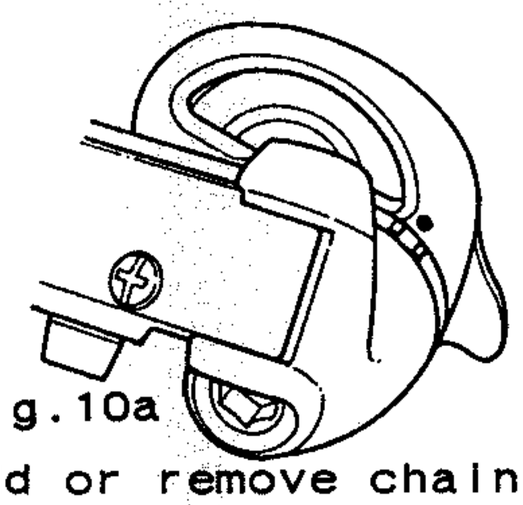


fig.10a

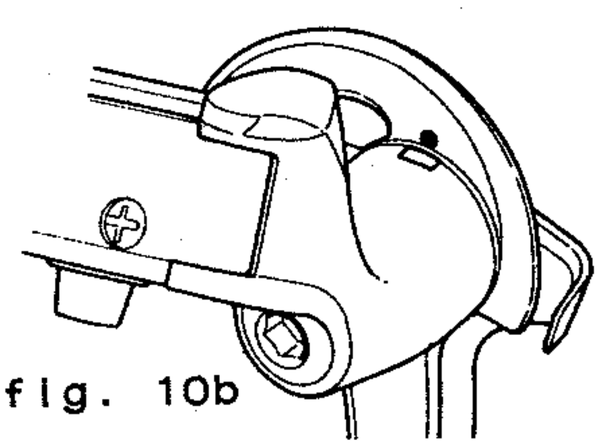


fig. 10b

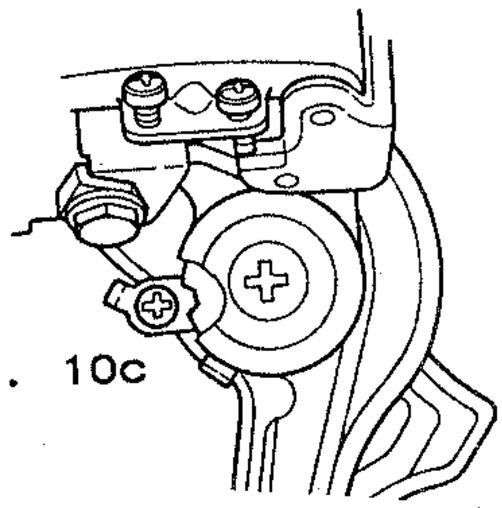


fig. 10c

Add or remove chain lengths as needed.

WARNING: ACCIDENTS CAN RESULT FROM INADEQUATE OR EXCESSIVE CHAIN LENGTH, OR USING GEARING WHICH EXCEEDS THE REAR DERAILLEUR'S CAPACITY. ALWAYS use the correct chain length, and gearing within the rear derailleur's capacity.

9. Shift the rear derailleur into lowest gear (the guide pulley directly under the largest rear sprocket - fig. 6). If the pulley

will not move far enough, turn the low gear limit screw (L) counterclockwise until it does. Then, turn the (L) adjusting screw clockwise to fine tune the rear derailleur so it shifts the chain consistently onto the largest cog without shifting it between the freewheel and the spokes.

WARNING: Maladjustment of the rear derailleur can cause the chain to shift off the freewheel, leading to possible loss of control of the bike, and injury to the rider.

10. With the rear derailleur still in lowest gear, pull back firmly on the shift lever (don't overdo it!) to stretch the cable and settle the cable casing. Then, push the lever all the way forward; loosen the cable anchor bolt; pull all the slack out of the cable; and retighten the cable anchor bolt to a torque of 40-50 kgf/cm.

11. Shift the chain on to the inner chainring and the largest freewheel sprocket. Using the angle adjusting screw (fig. 11), move the guide pulley up as close to the largest freewheel sprocket as you can. If it is too close, the rear derailleur will not be able to shift the chain off of the largest cog. In this case, move the guide pulley away from the largest cog, again using the angle adjusting screw, until the rear derailleur can shift the chain off the largest cog onto the second cog. If the chain will not shift off the largest cog, even with the derailleur all the way back, the "largest sprocket" capacity of the rear derailleur has been exceeded. Replace it with a rear derailleur that has a longer cage.

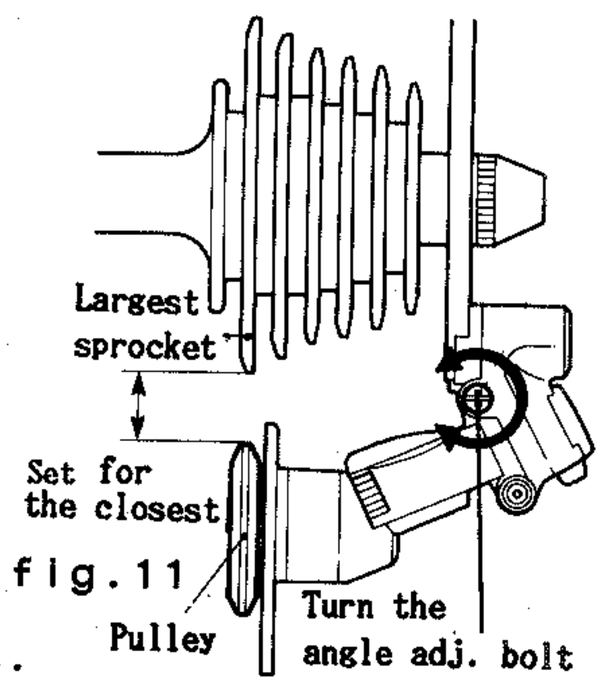


fig.11

12. Turn the cranks forward and shift the shift lever back and forwards several times. If the derailleur overshifts on either the smallest or the largest sprocket, turn the appropriate limit adjusting screw clockwise. If the derailleur undershifts, turn the appropriate limit screw clockwise. **CAUTION:** This adjustment must be precise for safe operation of the bike.

13. Shift the chain onto the outer chainring and smallest freewheel sprocket. Set the levers to index mode. (With IPC levers, turn the indicator dial to "UL" for Ultra-7 freewheels; "RE" for regular spaced freewheels. With IFC levers, loosten the friction adjusting screw no more than 2 full turns, and turn the indicator dial from "friction" to "index". Then, re-tighten the frictin adjusting screw.) Turning the cranks forward, shift the lever one stop. Whenever shifting to a larger cog, remember to hold the lever against the built-in "lash" described under "IFC Levers" in Section II A. The chain may or may not shift onto the second outboard cog. If it doesn't shift, or if it does and the chain grinds, take one of the following steps:

a. If the chain does not move far enough to smoothly engage the second sprocket (undershift), gradually turn the cable adjusting barrel (fig. 8) counterclockwise untill you have smooth shifting.

b. If the chain moves too far (overshift), gradually turn the cable adjusting barrel (fig. 8) clockwise untill you have smooth shifting.

14. Fine tuning is accomplished by shifting in rapid succession from one cog to the next, unscrewing the adjusting barrel (counter-clockwise) for hesitant downshifts (towards **inboard** cogs), and screwing the adjusting barrel in (clockwise) for hesitant upshifts (towards **outboard** cogs).

15. If fine tuning is difficult, please refer to the checklist and trouble-shooting guide.

16. Occasionally lubricate pivot points and bearing surfaces with light oil.

IF IT DOESN'T WORK:

If you encounter shifting problems on an installed **AccuShift** system when in the Index mode, **first** check the efficiency of the cable transmission. With the chain on any except the innermost cog, move the shift lever just enough to take up the small ammount of free movement designed into it. The rear derailleur must move a corresponding ammount. If it does not, there is too much drag on the cable, and the source of the drag must be located and eliminated.

Having made this check, if trouble persists check the following 10 points. For details, refer to the appropriate sections in the preceeding pages.

NOTE: Some bikes will work acceptably even if they do not conform to all of the recommended dimensions or component requirements. **If it works, don't fix it.**

1. LEVER: If **IPC levers** are used, confirm that the shifter boss is correctly oriented on the downtube (see diagram). Then, confirm that the selector dial is set to "UL" for Ultra-7 freewheels, or "RE" for regular 6 & 5 speed freewheels.

If **IFC levers** are used, confirm that you are not trying to mix **AX-3000** components with **NON AX-3000** components>

2. CABLE: Confirm that the cable is a quality 1.2mm wound type (available from SunTour).

3. **CASING:** Confirm that the cable casing is the correct type: either laminated, or, for lengths between thumbshifters and downtube, compressionless. Be absolutely certain that the casing has been lubricated internally, and its ends are either capped or trimmed and squared. Also, be certain that the ends of the casing are well seated and secure in all casing sockets. Avoid sharp bends in the casing.

4. **FRAME CABLE GUIDES:** These should be metal. Above the BB shell is preferred. Plastic cable guide mounted under the BB shell can cause problems by causing cable drag. In some cases, this can be corrected by generously lubricating the cable channel; but this is a temproary solution, and must be repeated frequently.

5. **FRAME BRAZE-ON CABLE STOPS:** Be sure the casing fits snugly inside the cable casing stop. The cable must have a straight path as it leaves the casing and passes through the socket. The casing sockets themselves must be rigid. Some folded metal sockets can cause problems by flexing.

6. **REAR DROP-OUT:** Dropouts should be no more than 7mm thick. For "drop dimension", refer to the section on **Frame Requirements.**

7. **REAR DERAILLEUR:** Must be **AccuShift** type. **a**-3000 rear derailleurs must be used with **a**-3000 shift levers. See the section on adjustment.

8. **CHAIN:** Be sure the chain is one of the approved chains, and is not worn to the point of allowing too much side-to-side flex.

9. **FREEWHEEL:** Must be a **Winner/Winner Pro** regular 5, 6, or Ultra-7; or an **a** 5 or 6 speed freewheel.

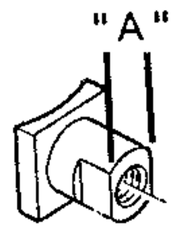
10. **HUB:** Freewheel side shell offset must be 33mm for 5 speed freewheels, or 37mm for regular 6 and Ultra-7 freeheels.

Section V: TROUBLESHOOTING

A. TROUBLESHOOTING Power AccuShift Index Power Controls:

PROBLEM: IPC lever does not fit, or is too loose on the boss.

CAUSE: Incorrect "A" dimension.



REMEDY: Remove paint and measure "A". The distance between the flats on the lever boss must be between 5.80 and 5.87mm. If it is greater than 5.87, it can be carefully filed down. If it is less than 5.80mm, it cannot be used with IPC levers.

Caution: Reshaping the lever mounting boss is a job for experienced craftsmen only. Don't learn the skill on someone else's frame.

PROBLEM: IPC index selector does not function properly.

CAUSE: Mode selector line is set between functions, OR lever boss flats incorrect positioned.

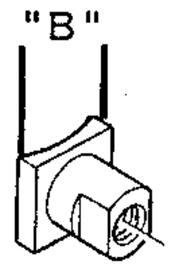
REMEDY: Check to confirm that the mode selector line is correctly lined up with the desired function arrow. If it is, check the orientation of the lver boss flats. The flats must be oriented parallel to the downtube. Note: If these flats are installed precisely 90 degrees to the downtube, the lever will shift Ultra freewheels when indicating "RE", and will shift regular spaced freewheels when on "UL".

PROBLEM: IPC lever stop will not fit the downtube.	**CAUSE:** Downtube diameter is greater than 28.6mm (1-1/8").	**REMEDY:** Replace the radiused lever stop with the flat lever stop.
PROBLEM: IPC lever movement is too tight or binding.	**CAUSE:** 1) Lever friction adjusting screw is too tight. 2) Lever boss is too large for the lever.	**REMEDY:** 1) Loosen lever friction adjusting screw slightly. 2) Re-check lever boss "A" dimension.
PROBLEM: IPC selector is difficult to turn.	**CAUSE:** Lever friction screw is too tight.	**REMEDY::** Loosen lever friction adjusting screw.
PROBLEM: IPC lever friction adjusting screw will not produce enough pressure to hold lever in place.	**CAUSE:** 1) Lever boss threading is not deep enough. 2) Braze or glue contaminating lever boss threading. 3) Spacer or washer is missing. 4) Boss is too long. 5) Flats are not deep enough.	**REMEDY:** 1) Grind a small amount off the end of the friction adjusting screw and re-check. NOTE: Grind off as little as possible. 2) Clean threads using M5 x 0.7 tap. 3) Check assembly against diagram in installation instructions. 4) <u>Carefully</u> grind a little off the end of the boss. 5)<u>Carefully</u> file the flats deeper. **Caution: Reshaping the lever mounting boss is a job for experienced craftsmen only. Don't learn the skill on someone else's frame.**

B. TROUBLESHOOTING AccuShift Index Friction Controls:

PROBLEM: IFC lever does not fit the boss.

CAUSE: Incorrect "B" dimension



REMEDY: Remove paint from lever boss and measure "B". It must be between 11.9mm and 12.0mm (0.469" to 0.472"). If too large, it may be filed down. Use great caution not to file too much or damage frame.

Caution: Reshaping the lever mounting boss is a job for experienced craftsmen only. Don't learn the skill on someone else's frame.

PROBLEM: IFC lever adaptor boss/lever stop will not fit downtube.

CAUSE:
1) Oversize downtube (IFC lever boss adaptor is radiused for 1-1/8" tubing).

2) Base of lever boss is flat.

REMEDY:: Non-radiused IFC lever boss adaptors are available from SunTour USA.

PROBLEM: IFC lever does not index properly.

CAUSE:
1) Mode indicator is not clearly set.

2) **α-5000** lever being used with **α-3000** rear derailleur.

3) **α-3000** lever being used with **α-5000** rear derailleur.

REMEDY:
1) confirm indicator is clearly set on "Index" mode

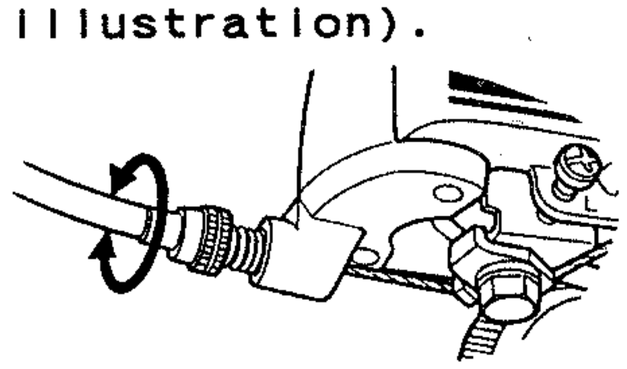
2) Check that you are not mixing **α-3000** and **α-5000** components. They are not interchangable. (Check markings on lever and derailleur).

C. SYSTEM TROUBLESHOOTING:

PROBLEM: Rear derailleur does not move far enough to shift chain correctly from outboard to inboard cogs.

CAUSE: Insufficient cable tension.

REMEDY: Increase cable tension by turning rear derailleur adjusting barrel counterclockwise (see illustration).



PROBLEM: Shifts onto inboard cog hesitant.

CAUSE: Improper adjustment of low limit adjustment screw

REMEDY: Turn low limit adjusting screw counter-clockwise.

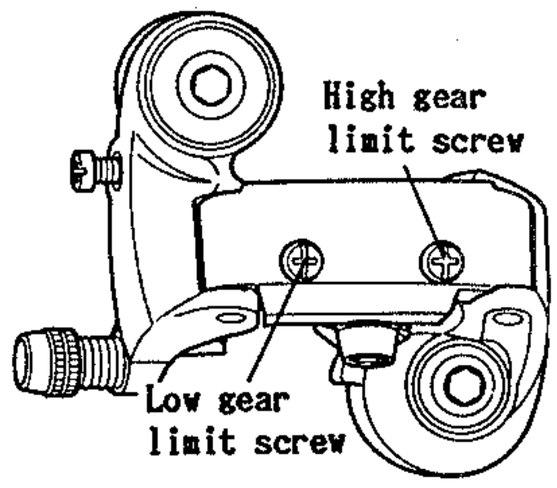
PROBLEM: Shifts from inboard to outboard cogs uncertain or vague;

OR: chain skips cogs when shifting from inboard to outboard cogs;

OR: grinding noise after shift from inboard to outboard cogs.

CAUSE: Excessive tension on shift cable.

REMEDY: Reduce cable tension by turning rear derailleur's cable adjusting barrel clockwise



PROBLEM: Shifts to the outermost cog are hesitant.

CAUSE: Improper adjustment of high limit adjusting screw.

REMEDY: Turn the high limit adjusting screw counterclockwise.

NOTE: This adjustment must be very precise for accurate indexing.

PROBLEM: Chain will not shift off, or is hesitant to shift off the largest cog (chain is noisy when the crank is turned backwards).	**CAUSE:** Rear derailleur's guide pulley too close to largest freewheel cog. Either the angle adjustment screw is incorrectly adjusted, or the largest cog exceeds the derail-leur's capacity.	**REMEDY:** Confirm the largest freewheel cog is within the rear derailleur's rated capacity. If it is, slowly turn the angle adjusting screw <u>clockwise</u> to rotate the rear derailleur away from the free-wheel and increase the distance between the guide pulley and the freewheel.
PROBLEM: Indexing performance gradually deteriorates.	**CAUSE:** Cable was not properly stretched and/or casing not properly settled before final adjustment.	**REMEDY:** See step 10 of INSTALLATION AND ADJUSTMENT section.
	CAUSE: Cable anchor bolt not fully tightened.	**REMEDY:** Re-tension cable and tighten rear derailleur cable anchor bolt to 40 - 50 kgf/cm.
	CAUSE: Freewheel not completely tightened on hub, or freewheel sprockets not fully tightened on free-wheel body.	**REMEDY:** Tighten the freewheel onto the hub; tighten all threaded cogs onto freewheel body.
	CAUSE: Rear derailleur's mounting bolt not completely tightened.	**REMEDY:** Tighten to a torque of 80 - 100 kgf/cm.
	CAUSE: Worn out freewheel or chain.	**REMEDY:** Replace.

PROBLEM: Consistently misshifts -- misses only certain cogs (other than first and last cog); misshifting follows **predictable pattern** through each stroke of the derailleur's range.

CAUSE: IPC lever selector ring set to "RE" when Ultra-7 freewheel is used; or, set to "UL" when regular 5 or 6 speed freewheel is used.

REMEDY: Confirm selector ring is at correct setting for the freewheel being used.

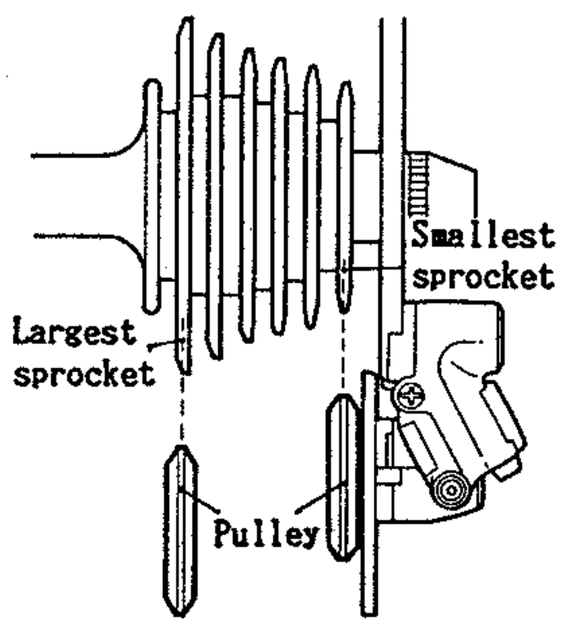
CAUSE: IFC shift lever being used with narrow (Ultra) freewheel.

REMEDY: IFC levers will only work with regular spaced freewheels. Replace Ultra freewheel with regular spaced freewheel; OR replace levers with IPC levers set to UL mode.

CAUSE: Ultra 6 freewheel used with IPC levers.

REMEDY: replace with Ultra-7 or regular spaced 6 speed freewheel if hub shell offset is 37mm; replace with regular 5 speed freewheel if hub shell offset is 33mm.

CAUSE: Rear derailleur's outer limit screw incorrectly adjusted.



REMEDY: Re-adjust the outer limit screw so the guide pulley is directly under the smallest sprocket. This adjustment is best done when the lever is in "Friction" or "Power" mode. After setting the outer limit screew, re-tension derailleur cable with adjusting barrel threaded all the way in.

PROBLEM: Consistent missshifts

(Continued)

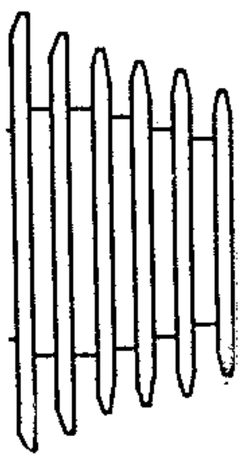
CAUSE: Rear dropout misaligned.

REMEDY: Straighten rear dropout. CAUTION: This will require compete re-adjustment of the rear derailleur and re-tensioning of cable.

CAUSE: Freewheel not **AccuShift** compatible.

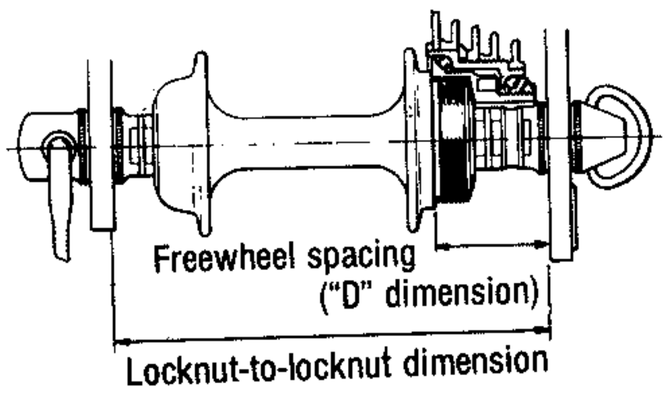
REMEDY: Replace with **AccuShift** compatible freewheel. **SunTour** ®, **Winner** or **Winner Pro** recommended.

CAUSE: Incorrect middle sprocket or sprockets.



REMEDY: If there is a problem shifting off one of the center cogs on the freewheel (from inboard to outboard direction), but the system is otherwise working well, one or more of the center cogs probably has a single bevel "chisel" type tooth profile. The chain may be having problems clearing the high outer edge of the cogs' teeth. Replace the cog with one that has a "double beveled" tooth profile. (See illustration.)

CAUSE: Hub shell offset is incorrect.



REMEDY: Measure the offset (see illustration). It must be 33mm for regular 5 speed freewheels, and 37mm for regular 6 and Ultra-7 speed freewheels.

PROBLEM: Random mis-shifts -- no predictable pattern.

CAUSE: This problem is usually caused by something preventing the cable from moving freely.

REMEDY: Find the source of binding and correct it. Check these points:

* Confirm quality 1.2mm wound cable is used.

* Check and confirm the correct cable casing has been installed, and all casing ends are well trimmed and squared.

* Be absolutely certain that all cable casing sockets and cable guides are firmly attached to frame tubes. If attached with rivets, confirm the rivets are secure. If they are not, the guide or socket may pivot and slip on the frame tube. This will be detrimental to **AccuShift** performance.

* Confirm that all casing sockets securely support all casing ends. Casing sockets that are too shallow or too large in diameter may allow misalignment of the casing inside the socket, causing both free play and binding of the cable.

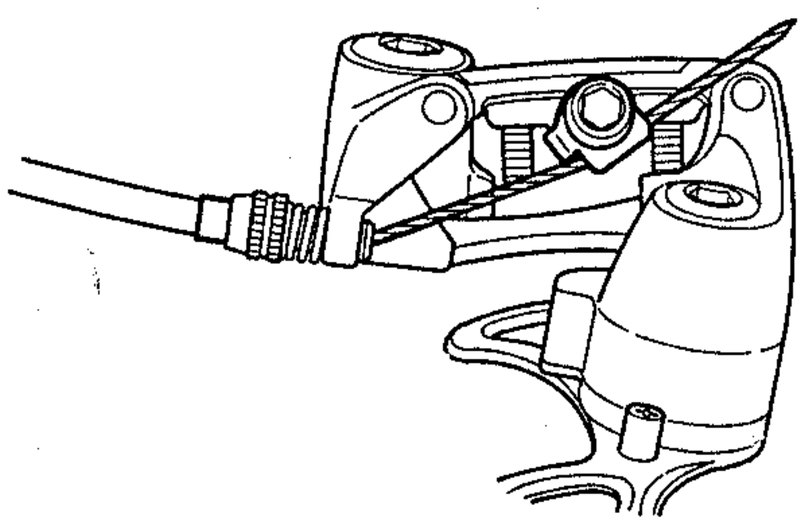
* The casing may be clogged or contaminated. Clean and lubricate inside all casings with light oil. The lining is no substitute for lubrication.

PROBLEM: Random mis-shifts

(Continued)

* The length of casing between the chainstay and the rear derailleur may be too short or long

* Pay particular attention to the bottom bracket cable guide. This is a frequent source of cable binding. If lubrication of this guide's cable channel causes a noticeable improvement in indexing performance, it is not recommended for use with **AccuShift**, and lubrication will be only a temporary remedy. If possible, replace the guide with a clamp-on type.



* Check to be sure the cable is anchored in the correct position on the rear derailleur (see illustration).

* If internal cable routing is used, chances can be great that there is some constriction in the routing that cannot be remedied. Use the following general check to determine if this is the case:

The efficiency of the cable transmission can be checked after all the above steps have been taken, or just as a general check: with the chain on any except the innermost cog, move the shift lever a

PROBLEM: Random mis-shifts

(Continued)

small amount. (There is a certain amount of free movement designed into the lever.) The rear derailleur must move a corresponding amount. If it does not, there is too much drag on the cable, and its source must be located and corrected.

CAUSE: Shift lever boss not rigidly attached to the downtube.

REMEDY: The bosses must be absolutly rigidly and mechanically attached to the frame.

CAUSE: Shift lever clamp not tightened fully onto downtube.

REMEDY: Tighten clamp bolt and re-tension cable.

CAUSE: Dirty or rusty chain.

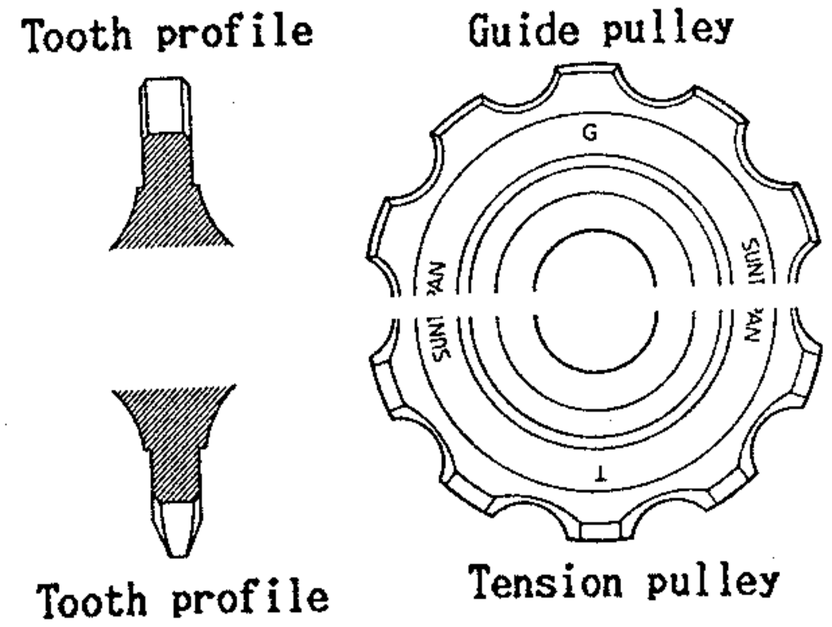
REMEDY: Clean and lubricate, or replace with a fresh **AccuShift** compatible chain.

CAUSE: Dirty or worn rear derailleur.

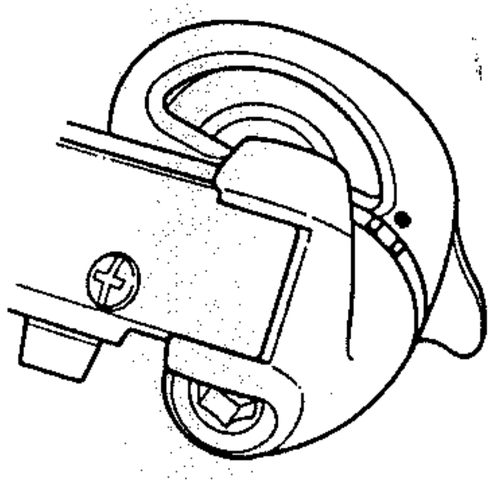
REMEDY: Clean or replace. (Check guide pulley in particular).

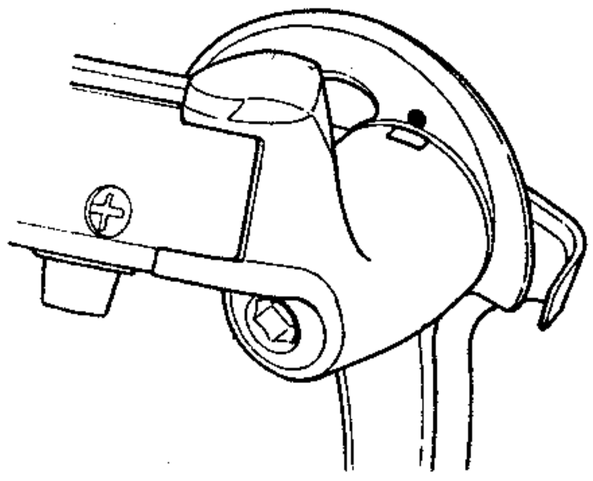
CAUSE: Rear derailleur's guide and tension pulleys reversed.

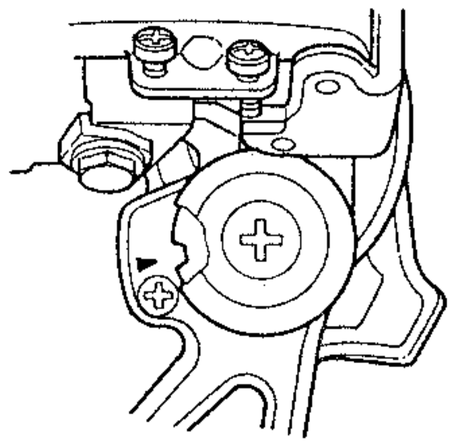
REMEDY: The pulleys are not interchange-able on SunTour **AccuShift** derailleurs. The guide pulley's tooth profile must be square, the tension pulley's pointed. (See illustration.)



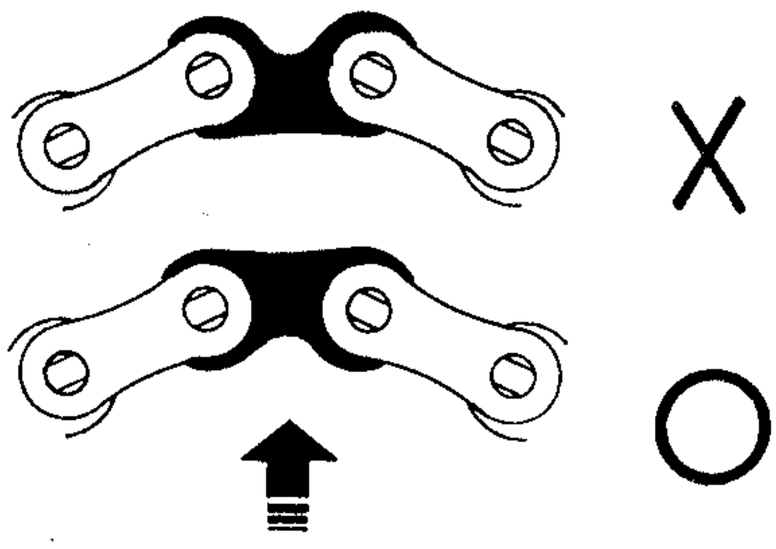
PROBLEM: Random mis-shifts (Continued)	**CAUSE:** Chain is not **AccuShift** compatible.	**REMEDY:** Replace with a **Superbe Pro**, **SunTour Pro**, or **Cyclone** chain. If a regular spaced free-wheel is to be used, HKK "Z" chain, HKK "Spirit" chain, or a DID "Lanner" chain may also be used.
	CAUSE: Incorrect chain length.	**REMEDY:** Correct the chain length by shifting into highest gear and adding or subtracting links so the dot on the pulley cage (or the pulley cage stop pin on the **ɑ-3000**) is lined up with the notch on the derailleur body. NOTE: the rear derail-leur's parallelogram must be parallel to the chainstay. (See illustrations.)

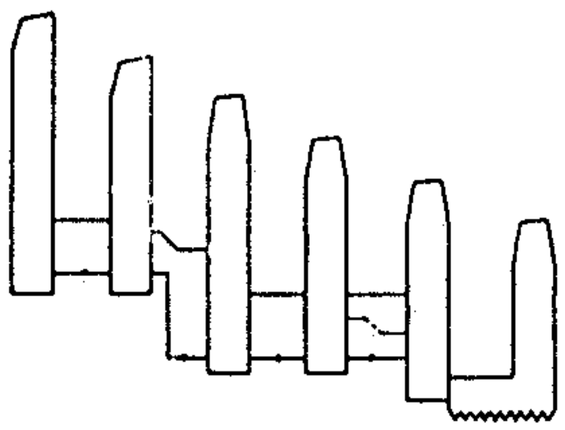






CAUSE: SunTour Pro chain installed upside-down.	**REMEDY:** Consult illustration and correct.

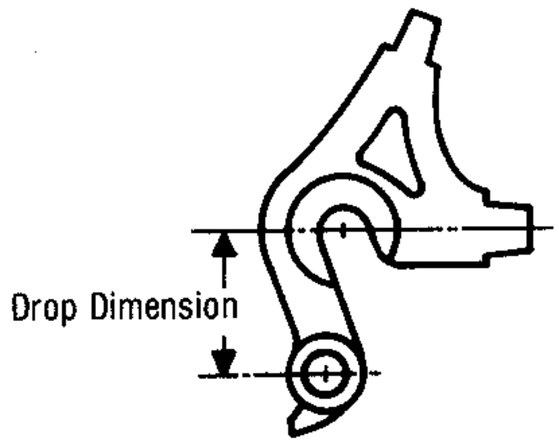


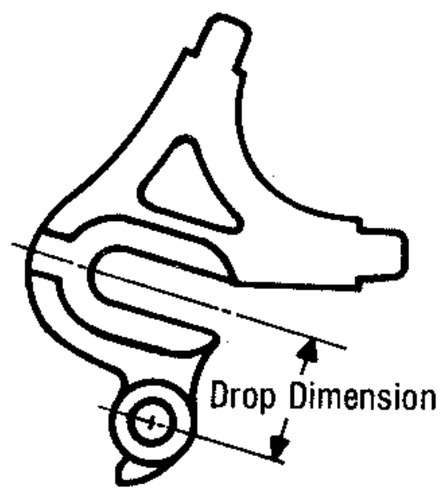
PROBLEM: Random mis-shifts (Continued)	**CAUSE:** Worn chain or freewheel.	**REMEDY:** First, replace the chain with a fresh **AccuShift** compatible chain. If trouble persists, replace the freewheel with a new or known good **AccuShift** compatible freewheel. **NOTE:** It is recommended that chains and freewheels allways be replaced as a set.
	CAUSE: Freewheel cogs installed backwards on freewheel body. 	**REMEDY:** Re-install cogs correctly. The "high side" of the chiseled tooth profiles of the cogs must be to outboard of the bike. (See illustration.)
	CAUSE: Rear dropout is misaligined (this can cause either "predictable" or "random" misshifting). Usually, this problem is accompanied by an unusually noisy drivetrain.	**REMEDY:** Straighten the rear dropouts.

PROBLEM: **Random** mis-shifts

(Continued)

CAUSE: Rear dropout not **AccuShift** compatible.





Drop Dimension range

24mm to 28mm

REMEDY: Consult rear dropout specifications (see illustration).

In some cases, an out-of-spec dropout may be corrected as follows:

* If the drop dimension is too large, the guide pulley is too far from the freewheel. Usually, this precludes the use of the particular frame. However, sometimes, the following will work:

a) Turning the rear derailleur angle adjusting screw counter-clockwise to move the upper pulley closer to the freewheel.

b) Moving the rear axle as far forward as safely possible. This is only possible with horizontal dropouts.

* If the angle of the derailleur stop tab is too great, this will also cause the guide pulley to be too far from the freewheel. Use the same remedies as you would for a dropout hanger that is too long; plus: in some cases, the tab can be carefully filed or ground to reduce this angle. CAUTION: If is too small, it will reduce the rear derailleur's largest cog capacity.

PROBLEM: **Random** mis-shifts (Continued)	**CAUSE:** Hub shell offset is incorrect; rear dropout too thick or thin.	**REMEDY:** Measure hub shell offset PLUS the thickness of the dropout (see illustration). The total should be as follows:

Ultra-7 freewheel:	43mm	- 45mm	(1.69" - 1.77")
Regular-6 freewheel:	42.5mm	- 45.5mm	(1.67" - 1.79")
Regular-5 freewheel:	38mm	- 41mm	(1.5" - 1.61")

	CAUSE: Rear derailleur's total gear capacity has been exceeded.	**REMEDY:** Either replace the rear derailleur with an **AccuShift** derailleur of greater capacity; or replace the chainrings and/or freewheel to reduce the total gear range. NOTE. The length of the rear derailleur hanger tab on the rear dropout can change a rear derailleur's rated capacity. Please consult chart.
	CAUSE: Damaged IFC or IPC lever.	**REMEDY:** Replace with known good lever and check.