

CHAPTER 5

CLUTCHES

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WARNING

All drive clutch maintenance, disassembly and assembly must be performed only by an authorized Polaris dealer who has attended current model Dealer Service Seminars, has received a certificate of completion, and displays the Polaris Servicing Dealer decal.

Because of the critical nature and precision balance incorporated into the drive clutch, it is absolutely essential that no attempt at clutch disassembly and/or repair be made without factory authorized tools and service procedures.

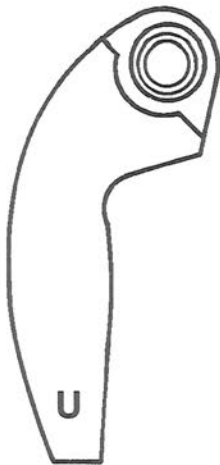
Essential Drive Clutch Tools

Refer to the Service Tool Catalog (PN 9914681) for photos and descriptions of all tools. A tool catalog update is available through the Polaris parts department. The part number is 9915235.

<u>Description</u>	<u>Part Number</u>
Offset Alignment Tool - 21/32" (1.7 cm) P-90 Clutches	2870914
Offset Alignment Tool - 5/8" (1.6 cm) P-85 Clutches	2870426
T-Handle Drive Clutch Puller (Large Shaft ID)	2870506
Drive Clutch Puller 14mm (Small Shaft ID)	2871855
Drive Clutch Puller - '99 550 Fuji Engines	2872084
Drive Clutch Puller - '99 700/800 XCR	2872085
Strap Wrench	2870336
Replacement Strap for 2870336	2870389
Spider Spanner Nut Driver (Jam Nut)	2870338
Spider Removal / Installation Tool	2870341
Holding Fixture	2871358
Holding Fixture Tab	5130518
Tapered Reamer	2870576
Spider Button Tool	2870985
Clutch Bushing Rebuild Tool Kit (P-85/P90)	2871025
P-85 Drive Clutch Compression Tool	2870984
Driven Clutch Puller (P-90)	2871056
Torque Wrench, 250 ft. lb.	Commercially Available
Torque Wrench, 0-200 in. lb.	Commercially Available
Clutch Compression Tool	8700220
Clutch Holding Wrench	9314177
SLP Button Tool	8716010
SLP Clutch Sheave Clamp Tool	8716020

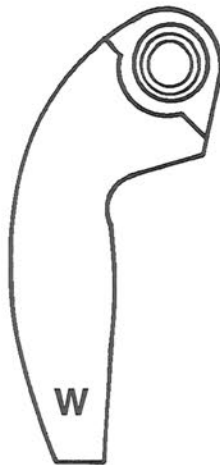
CLUTCHES

Drive Clutch Weight Identification - Actual Size



U

Gram Weight: 34 ± 1
PN 5630107



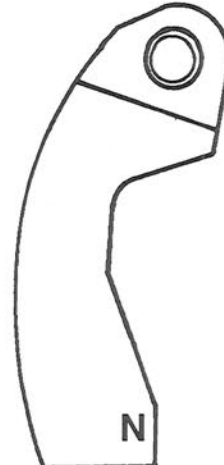
W

Gram Weight: 37.5 ± 1
PN 5630109



G

G - (B Modified)
Gram Weight: 41.5 ± 1
PN 5630063



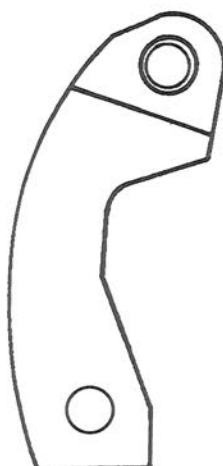
N

A
Gram Weight: 47.5 ± 1
PN 5630080



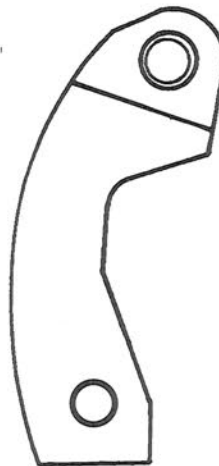
02

02
Gram Weight: 49 ± 1
PN 5630225



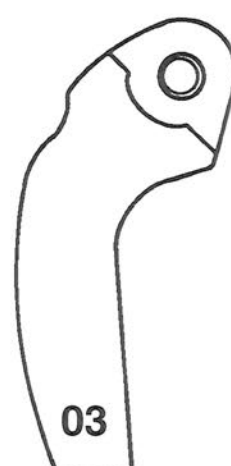
O

Gram Weight: 51
PN 5610088



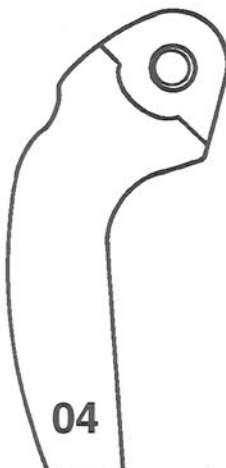
0

Gram Weight: 53 ± 1
PN 5630174



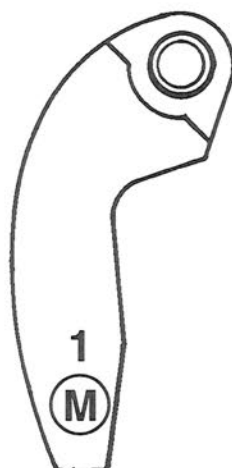
03

03
Gram Weight: 32.5 ± 1
PN 5630227



04

04
Gram Weight: 57.5 ± 1
PN 5630229



1

M

M1 (Modified)
Gram Weight: 46.0 ± 1
PN 5630301



K1

K1
Gram Weight: 39 ± 1
PN 5630144

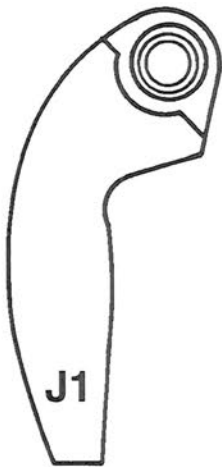


P1

P1
Gram Weight: 42 ± 1
PN 5630089

CLUTCHES

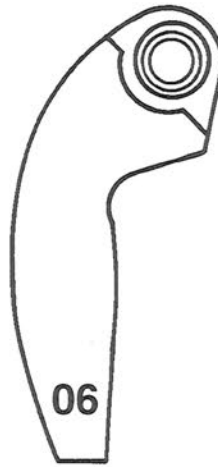
Drive Clutch Weight Identification - Actual Size



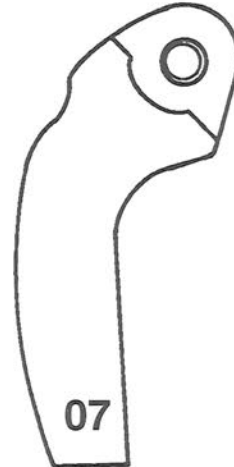
J1
Gram Weight: 44 ± 1
PN 5630065



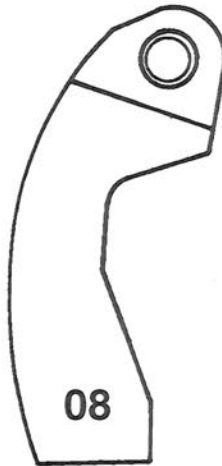
05
Gram Weight: 53.5 ± 1
PN 5630234



06
Gram Weight: 50 ± 1
PN 5630243



07
Gram Weight: 52 ± 1
PN 5630244



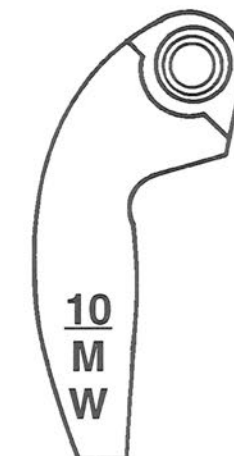
08
Gram Weight: 47.5 ± 1
PN 5630245



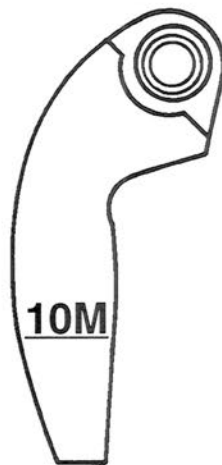
15
Gram Weight: 55.5 ± 1
PN 5630274



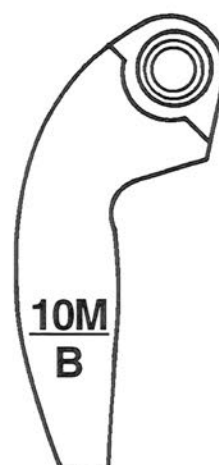
10 Bushed
Gram Weight: 51.5 ± 1
PN 1321526



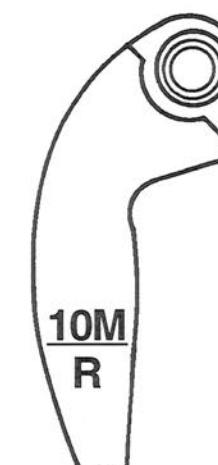
10M-W Bushed
Gram Weight: 46 ± 1
PN 1321527



10M Bushed
Gram Weight: 49.5 ± 1
PN 1321528



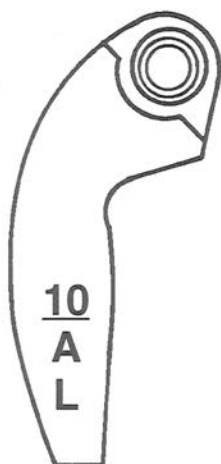
10M Blue Bushed
Gram Weight: 47.5 ± 1
PN 1321529



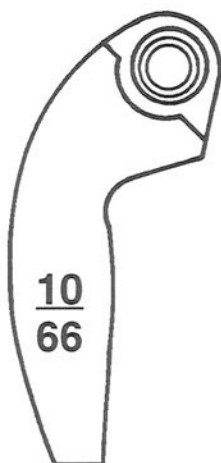
10M Red Bushed
Gram Weight: 44 ± 1
PN 1321530

CLUTCHES

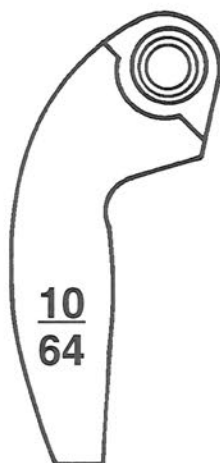
Drive Clutch Weight Identification - Actual Size



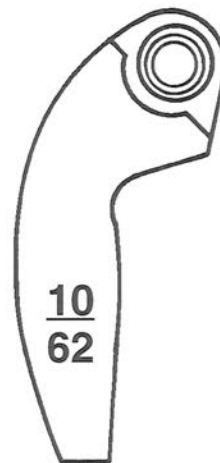
10-AL Bushed
Gram Weight: 53 ± 1
PN 1321531



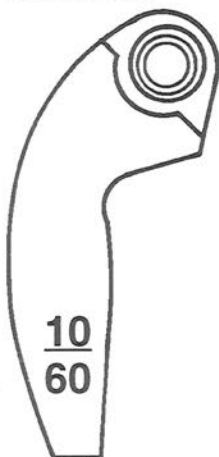
10-66 Bushed
Gram Weight: 66
PN 1321584



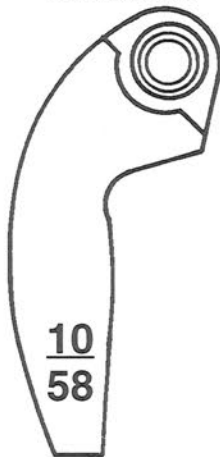
10-64 Bushed
Gram Weight: 64
PN 1321585



10-62 Bushed
Gram Weight: 62
PN 1321586



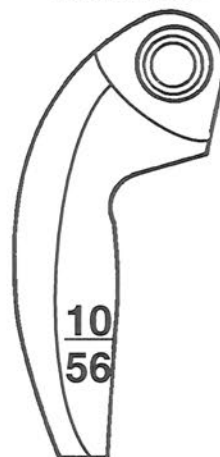
10-60 Bushed
Gram Weight: 60
PN 1321587



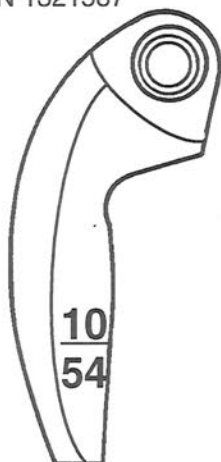
10-58 Bushed
Gram Weight: 58
PN 1321588



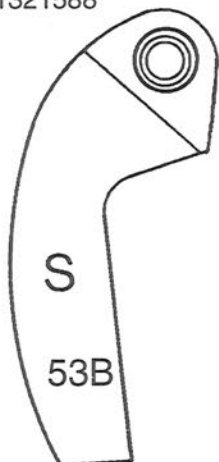
10A Bushed
Gram Weight: 55
PN 1321589



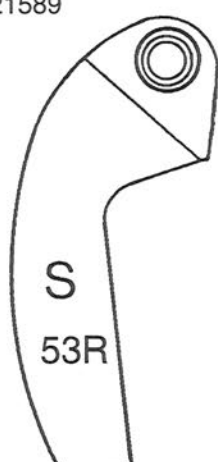
10-56 Bushed
Gram Weight: 56 ± 1
PN 1321684



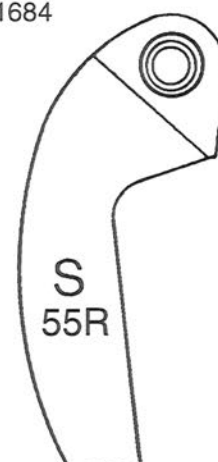
10-54 Bushed
Gram Weight: 54 ± 1
PN 1321685



S53B
Gram Weight: 49 ± 1
PN 1321730



S53R
Gram Weight: 51 ± 1
PN 1321731



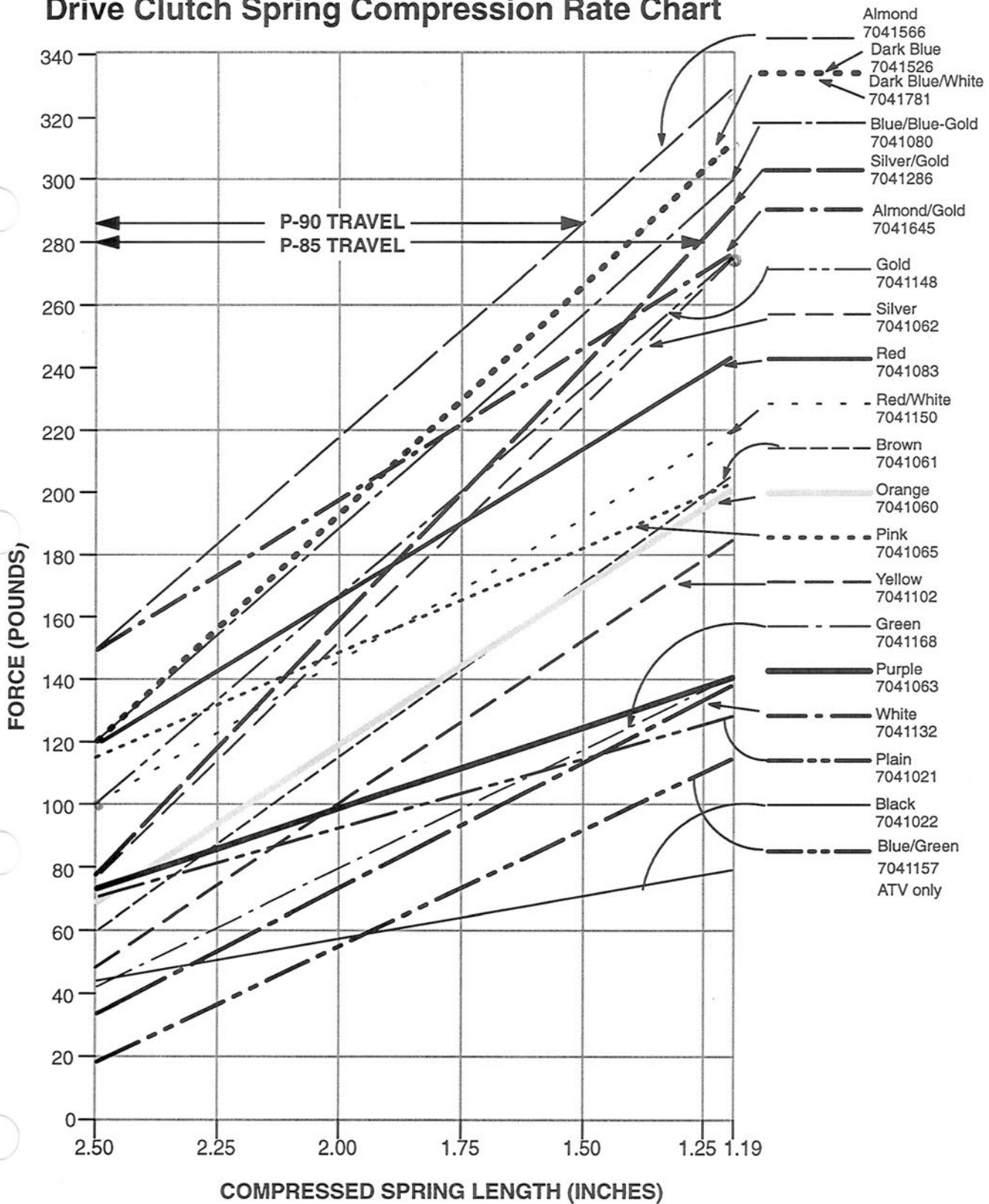
S55R
Gram Weight: 53 ± 1
PN 1321759

CLUTCHES Drive Clutch Spring Rates

The following chart will aid in the setup and balance of engine RPM power curves for special converter tuning requirements such as high operating altitude, heavy loads, mountainous terrain, etc.

Drive Clutch Spring Compression Rate Chart

Drive Clutch Spring Compression Rate Chart



CLUTCHES

Drive Clutch Spring Data

PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH +/- .125"
7041021	Clear	.157"	4.38"
7041022	Black	.140"	4.25"
7041063	Purple	.168"	4.37"
7041062	Silver	.208"	3.12"
7041065	Pink	.177"	4.69"
7041060	Orange	.196"	3.37"
7041080	Blue/Gold	.207"	3.50"
7041083	Red	.192"	3.77"
7041102	Yellow	.192"	2.92"
7041061	Brown	.200"	3.06"
7041132	White	.177"	2.92"
7041168	Green	.177"	3.05"
7041148	Gold	.207"	3.25"
7041150	Red/White	.192"	3.59"
7041286	Silver/Gold	.218"	3.05"
7041080	Blue	.207"	3.55"
7041526	Dark Blue	.218"	3.52"
7041781	Dark Blue/White	.225"	3.52"
7041566	Almond	.207" (Square)	3.65"
7041645	Almond/Gold	.207"	4.0"

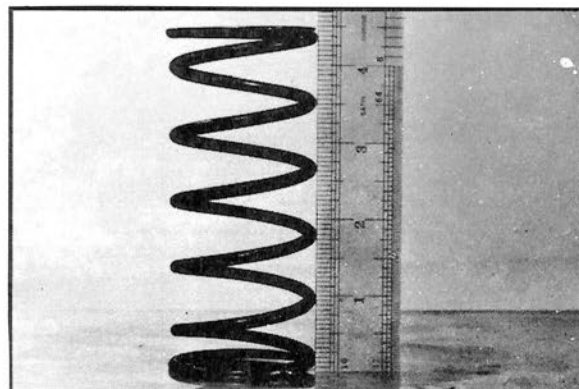
CAUTION:

Never shim a drive clutch spring to increase its compression rate. This may result in complete stacking of the coils and subsequent clutch cover failure.

Maximum efficiency of the variable speed drive system is dependent upon many factors. Included in these are converter offset and alignment, belt tension, belt to sheave clearance, and internal condition of the drive and driven clutch components. One of the most critical and easily serviced parts is the drive clutch spring. Due to the severe stress the spring is subject to during operation, it should always be inspected and checked for tolerance limits during any clutch operation diagnosis or repair.

With the spring resting on a flat surface, measure free length from outer coil surfaces as shown. Refer to the chart above for specific free length measurements and tolerances.

In addition to proper free length, the spring coils should be parallel to one another when placed on a flat surface. Distortion of the spring indicates stress fatigue. Replacement is required.



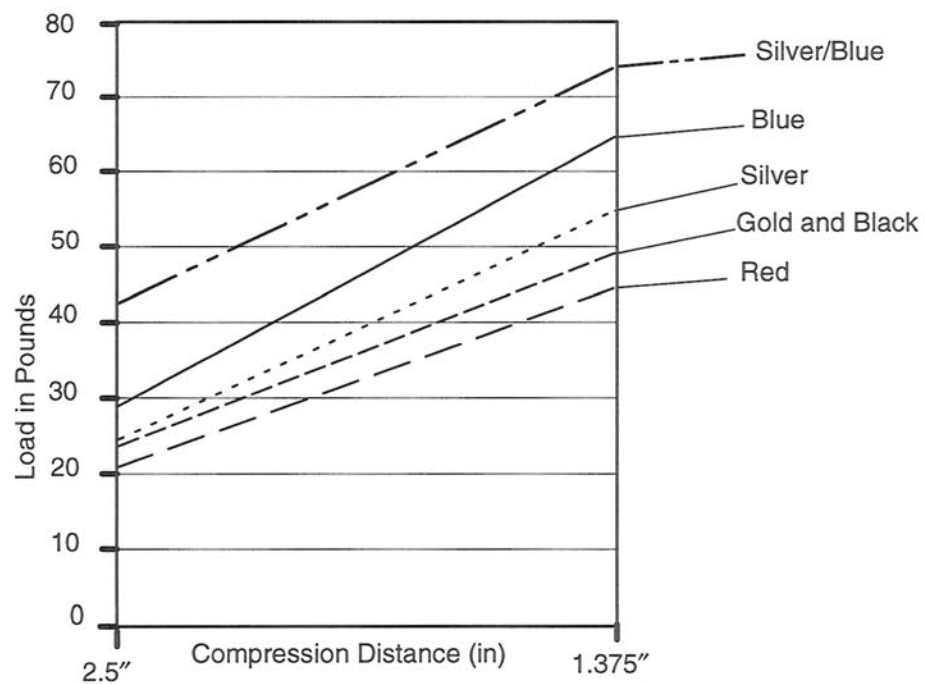
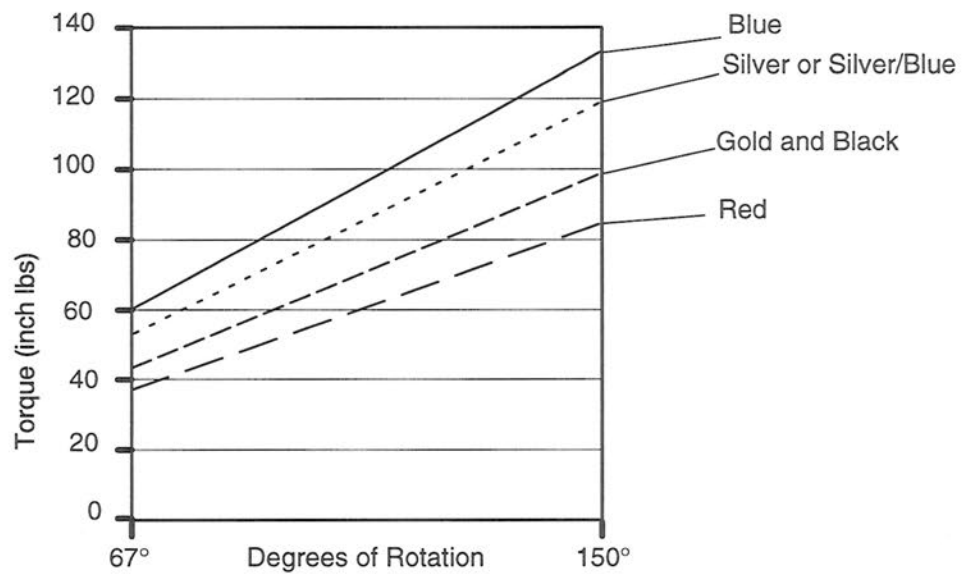
CLUTCHES

Driven Clutch Spring Rates

Driven Clutch Spring Data

Part Number	Description
7041198	Red
7041782	Black-5 Coil
7041501	Gold-6 Coil
7041499	Silver
7041296	Blue
7041646	Silver / Blue

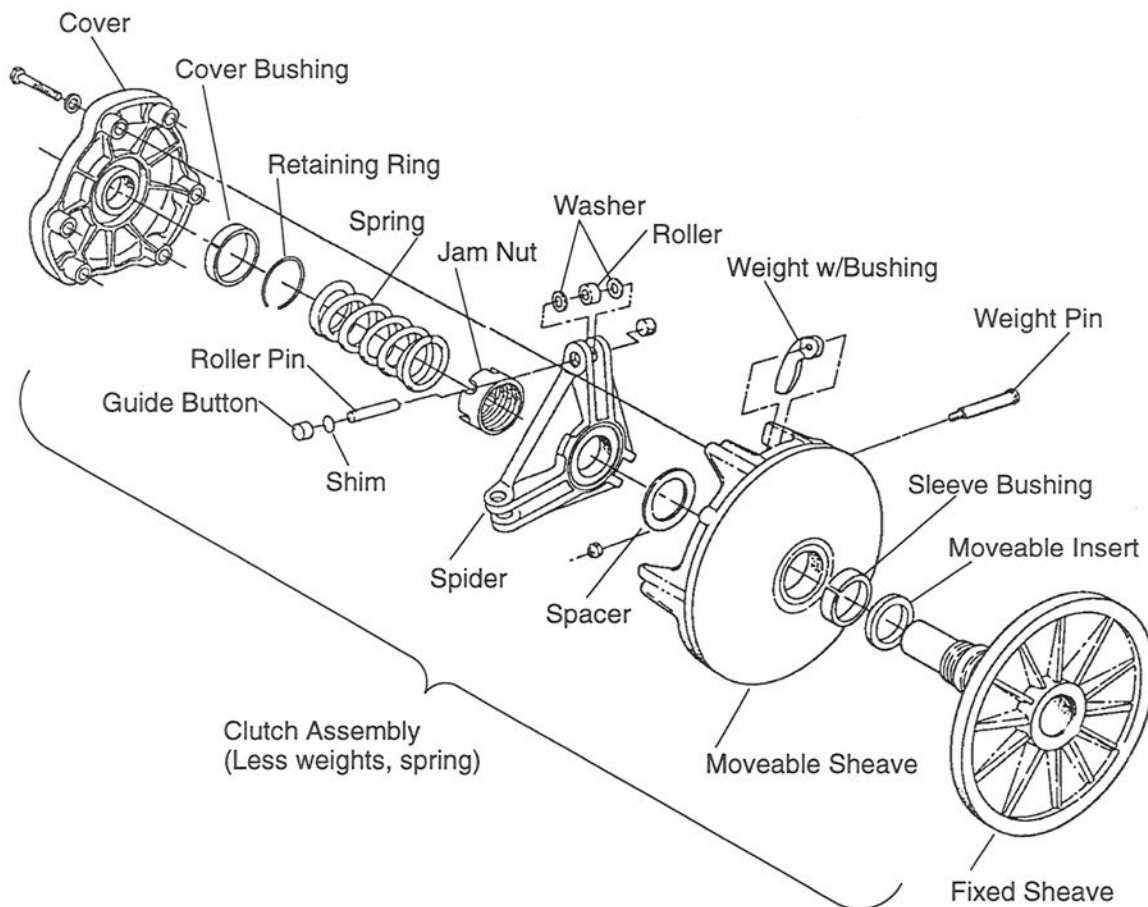
Driven Spring Charts



CLUTCHES

P-85 Drive Clutch Exploded View - Typical

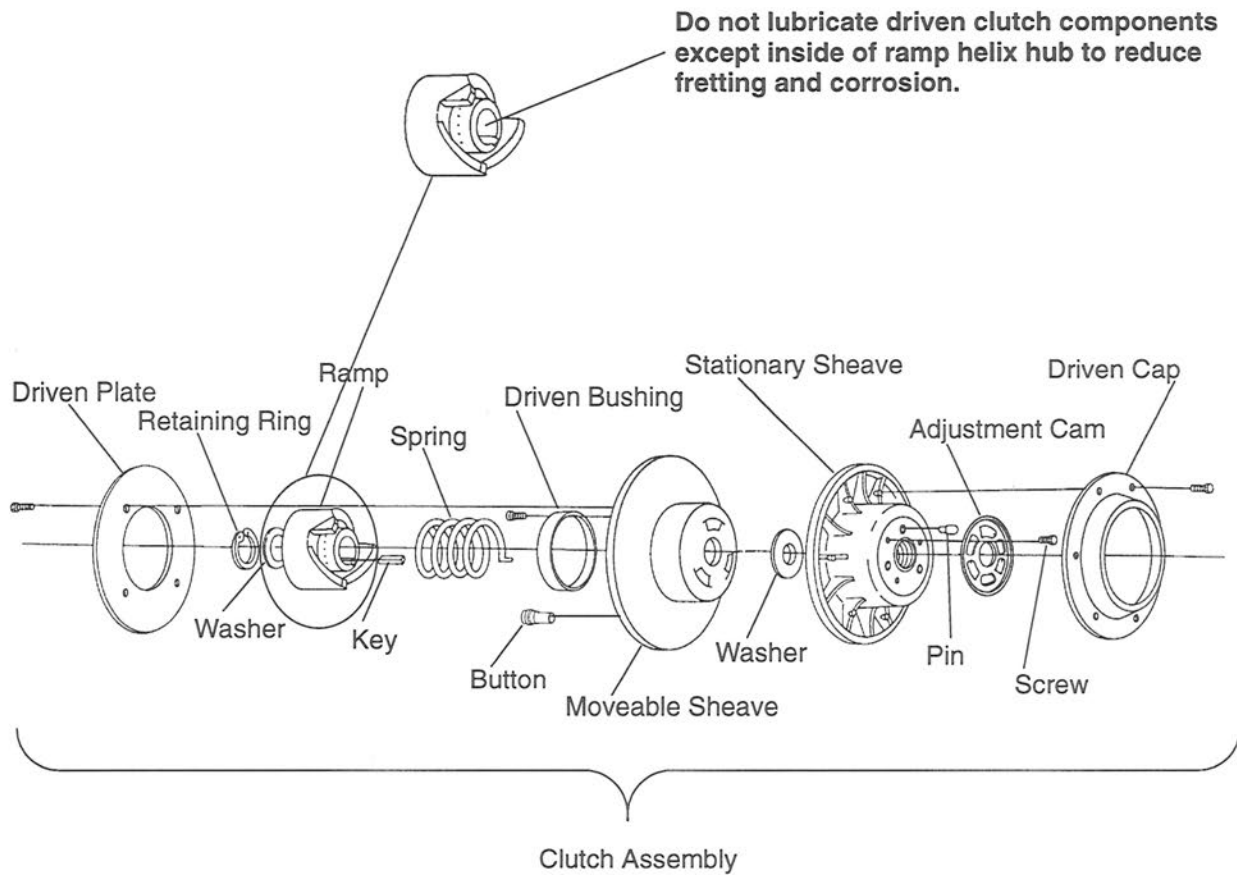
Do not lubricate drive clutch components



Replacement clutches come complete and balanced without clutch weights and clutch spring. The clutch cover, spider, and sheaves cannot be purchased separately as replacement parts.

CLUTCHES

P-85 Driven Clutch Exploded View - Typical

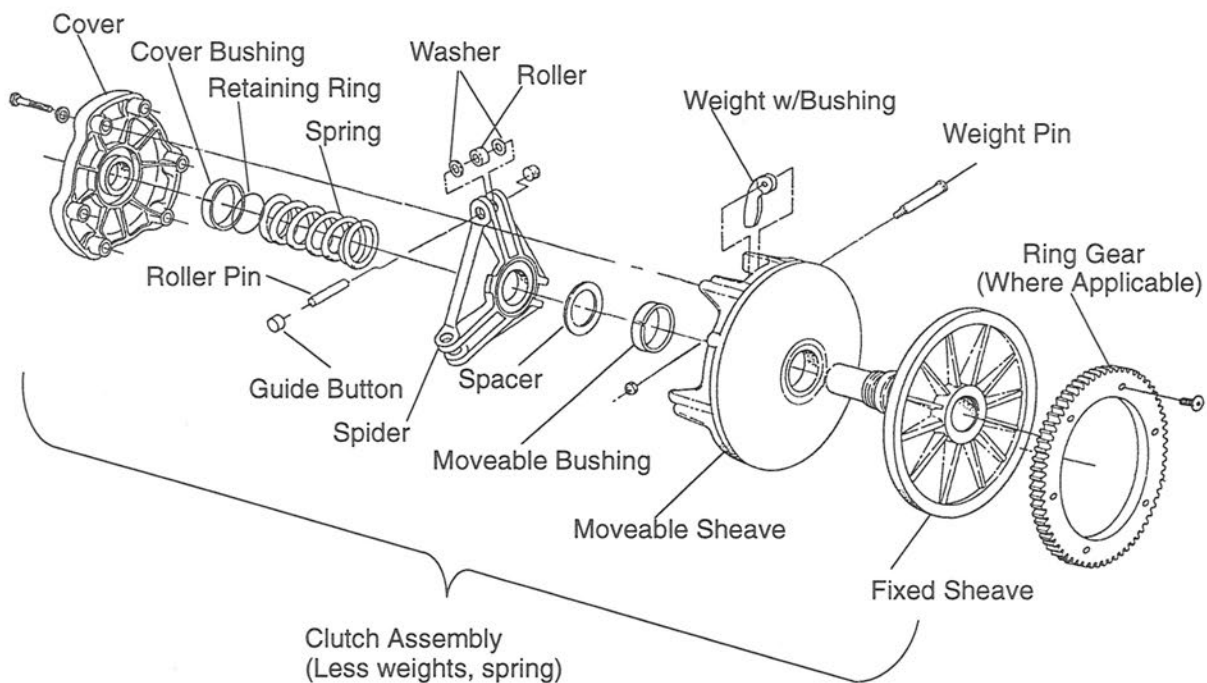


Replacement driven clutches come complete with ramp and spring. The moveable and stationary sheaves cannot be ordered as separate service parts.

CLUTCHES

P-90 Drive Clutch Exploded View - Typical

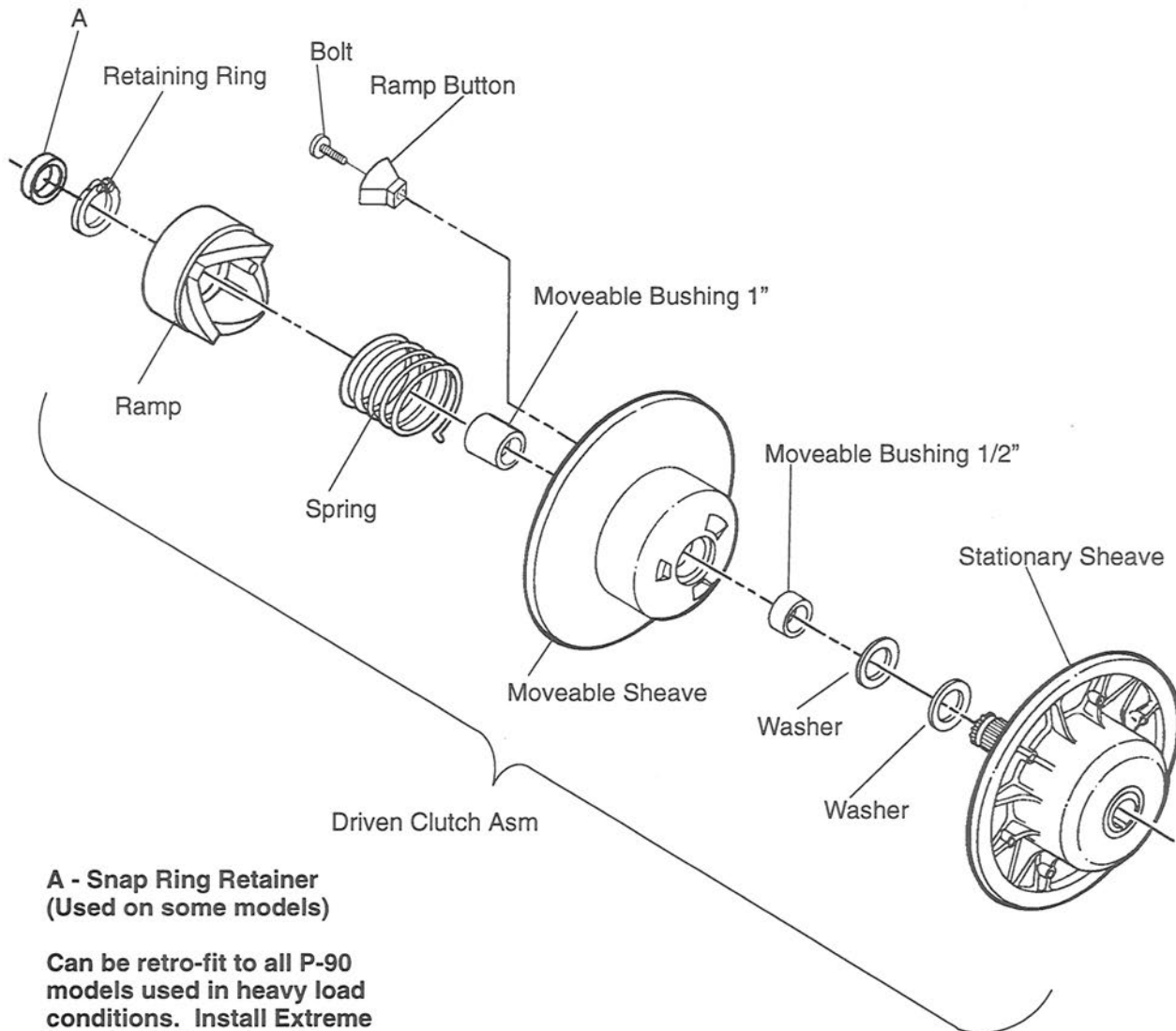
Do not lubricate drive clutch components



Replacement clutches come complete and balanced without clutch weights and clutch spring. The clutch cover, spider, and sheaves cannot be purchased separately as replacement parts. Ring gears are not included with replacement P-90 clutches and must be purchased separately.

CLUTCHES P-90 Driven Clutch Exploded View

Do not lubricate driven clutch components except inside of ramp (helix) hub to reduce fretting and corrosion.



Replacement driven clutches come complete with ramp and spring. The moveable and stationary sheaves cannot be ordered as separate service parts.

CLUTCHES

Operation

The Polaris drive system is a centrifugally actuated variable speed belt drive unit. The drive clutch, driven clutch, and belt make up the torque converter system. Each clutch comes from the factory with the proper internal components installed for its specific engine model. Therefore, modifications or variations of components at random are never recommended. Proper converter setup and adjustments of existing components must be the primary objective in converter operation diagnosis.

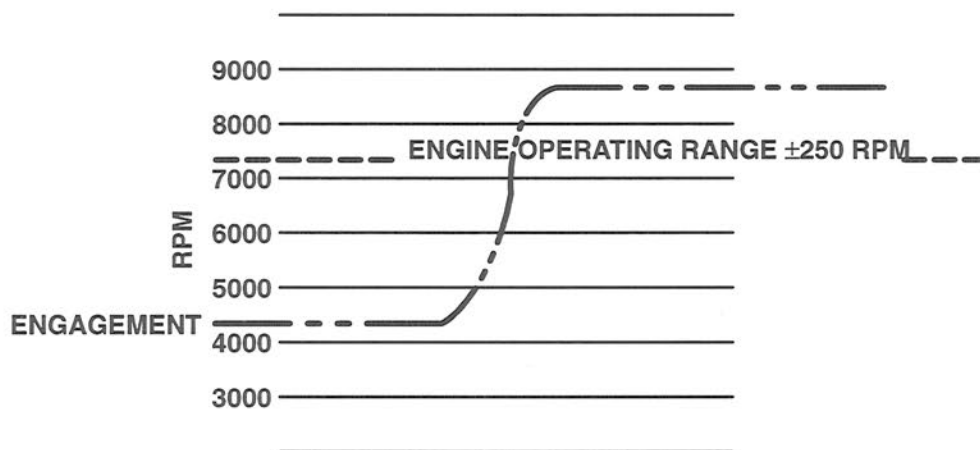
CAUTION:

All converter maintenance repairs must be performed only by an authorized Polaris service technician who has attended a Polaris sponsored service training seminar and understands the proper procedures as outlined in this manual. Because of the critical nature and precision balance incorporated into the drive clutch, it is absolutely essential that no attempt at clutch disassembly and/or repair be made without factory authorized special tools and service procedures. Any unauthorized modifications to clutches, such as adding or removing weights, will void the warranty.

Relationship Between Drive Clutch Weights And Spring In Maintaining Operating RPM

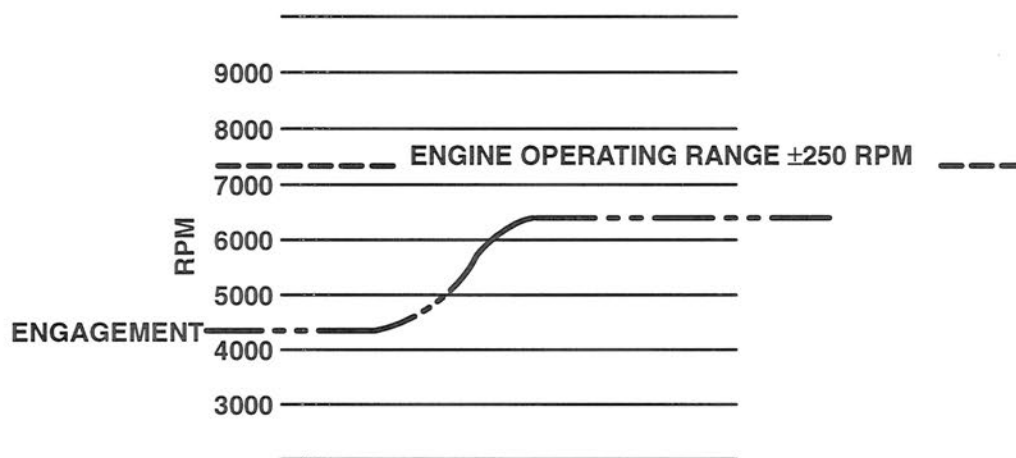
The drive clutch is an RPM and torque sensing unit designed to transfer the maximum amount of horsepower from the engine to the ground. This is accomplished by weights and a spring inside the unit which react to the centrifugal force from the engine RPM.

The spring and weights work in combination. In a properly set up clutch, the maximum desired operating RPM will be reached immediately after clutch engagement, under full throttle conditions. To gain optimum power this RPM should be maintained. As centrifugal force pushes the weights against the rollers, the moveable sheave will force the belt to climb up the drive clutch sheave and increase vehicle speed.

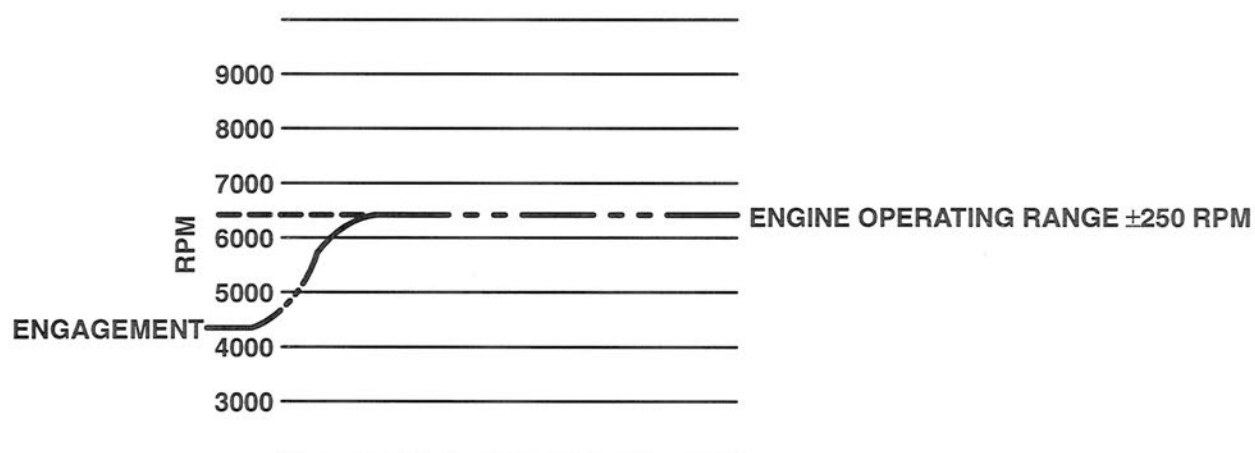


If the weights are too light, or the spring rate too high, the maximum RPM will be too great and the drive belt will not move into high gear at the top of the clutch.

CLUTCHES Operation



If the weights are too heavy, or spring rate too low, the engine RPM will be low and the drive clutch will upshift too fast, keeping the engine out of its power band.



If the weights and spring are matched properly, the engine RPM will go to the desired range and remain there on both upshift and backshift.

CLUTCHES

Driven Clutch Operation

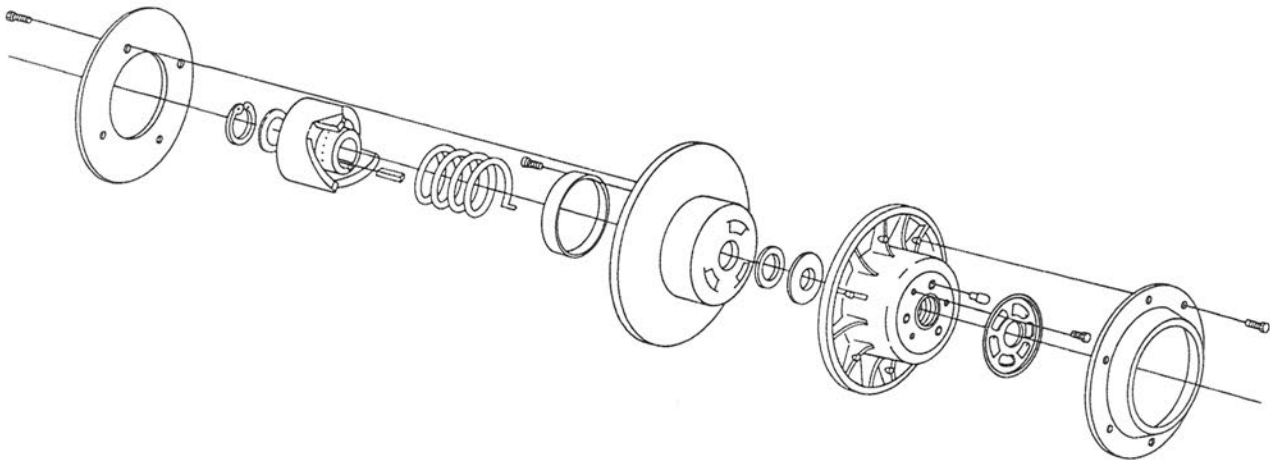
The driven clutch operates in conjunction with the drive clutch. Its function is to maintain drive belt tension preventing slippage, and sense variations in load requirements necessary to maintain optimum engine torque output and load requirements from the track. Output torque is transmitted through the chaincase jackshaft and chaincase to the front drive shaft and track.

When the load on the driven clutch is increased and becomes greater than the torque delivered from the engine, the driven clutch becomes dominant and overrides the drive clutch. The driven clutch downshifts into a ratio which will match the increased load.

Because the driven clutch can sense and shift into the proper ratio, engine RPM will remain within the specified range.

Driven Clutch Adjustments

The driven clutch has a provision for varying the torque required to change its ratio. It can be readjusted by relocating the spring in the helix which in turn increases or decreases the amount of load required to change the ratio.



Driven Clutch (Typical P-85)

Removal

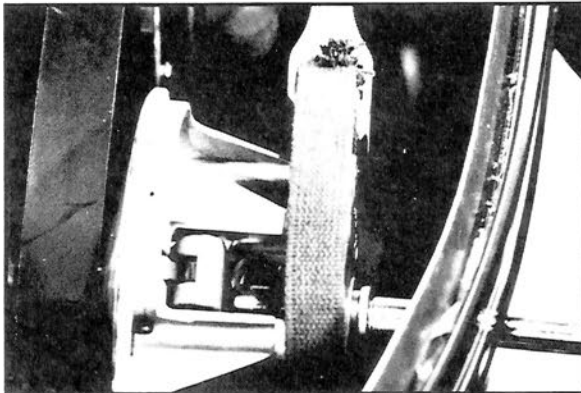
1. Hold clutch with strap wrench. Remove drive clutch retaining bolt, grease puller thread and tip lightly and install puller into clutch. Tighten puller with a wrench, or strike t-bar with a hammer until clutch is removed.

Strap Wrench PN 2870336
Clutch Puller PN 2870506- 3/4-16 ID Clutch
Clutch Puller PN 2871855-14mm ID Clutch
Clutch Puller PN 2872084 - 550 Fan
Clutch Puller PN 2872085 - 700/800 XCR

NOTE: 440, 500, 600, & 700 domestic twins use puller PN 2871855. The 1999 Trail RMK and Supersport use puller PN 2872084, and the 700/800 XCR use puller PN 2872085.

2. Slight galling or scoring of bore taper can usually be corrected using a tapered reamer. Place reamer in a vise and lubricate with cutting oil. Clean clutch taper by manually rotating clutch clockwise. Do not ream taper more than required to remove galling or scoring. Never use power tools to ream taper of drive clutch.

Tapered Reamer PN 2870576

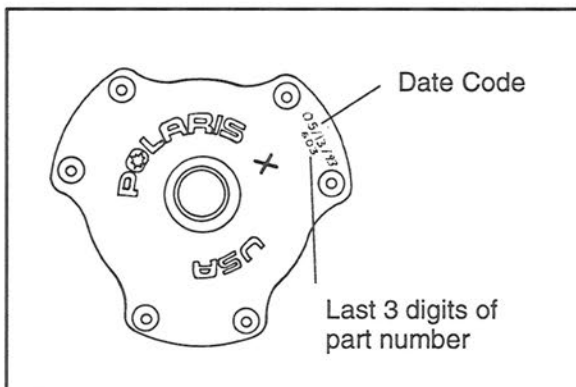


CAUTION:

Never use an air impact wrench for installing or removing a drive clutch. It will loosen the spider torque value and could cause engine crankshaft damage.

Identification

This number indicates internal clutch component variation for individual engines. For easy identification, refer to the three numbers behind date code on clutch cover plate. These numbers are the last three digits of the clutch part number.



CLUTCHES

Drive Clutch

Disassembly and Inspection

1. Install drive clutch in clutch compression tool (8700220). Mark both moveable and fixed sheave, cover, and spider with a permanent marker.

CAUTION:

Sheaves must be marked to provide a reference point for clutch balance and spider indexing. If the sheaves are not marked, and spider shim washers are changed or misplaced, the will clutch will be out of balance and must be replaced. See page 5.24 for indexing procedure.

2. Carefully and evenly remove cover attaching bolts. Do not allow side loading or misalignment of cover or bushing may be damaged. Remember there is spring tension on the cover. Inspect cover bushing for wear. See page 5.39 for inspection and repair procedure.

Drive Clutch Compression Tool
PN 8700220

Drive Clutch Holding Fixture
PN 2871358

3. Mount drive clutch securely in the holding fixture. On models equipped with a spider jam nut (P-85 Clutches), remove jam nut in a counterclockwise direction (standard thread) using the special tool.

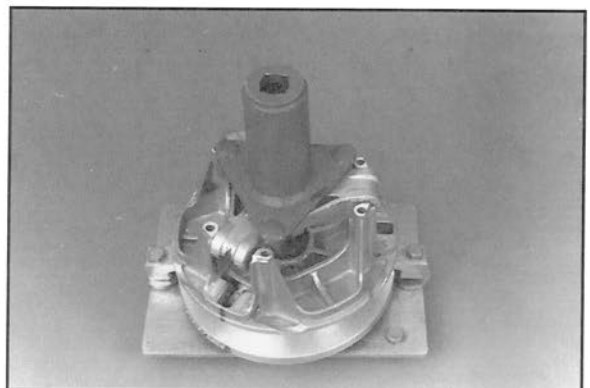
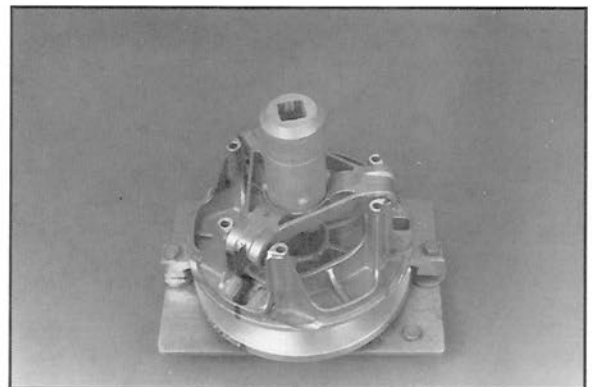
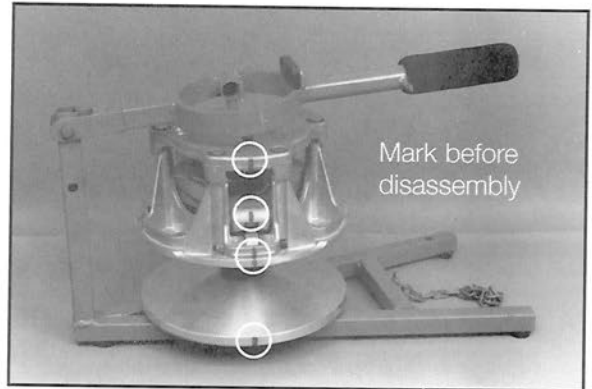
Spider Spanner (Jam Nut) Tool

PN 2870338

4. Install spider removal tool and remove spider in a counterclockwise direction (standard thread).

Spider Removal Tool

PN 2870341



Disassembly, Cont.

5. Measure the total thickness of the spacer washers installed beneath spider and record.

CAUTION:

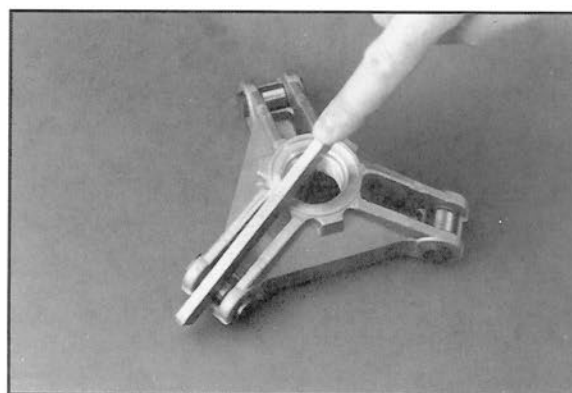
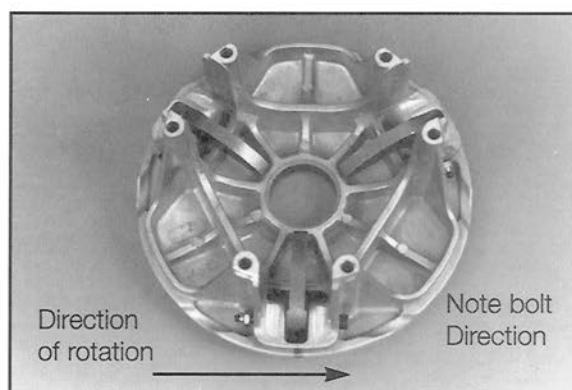
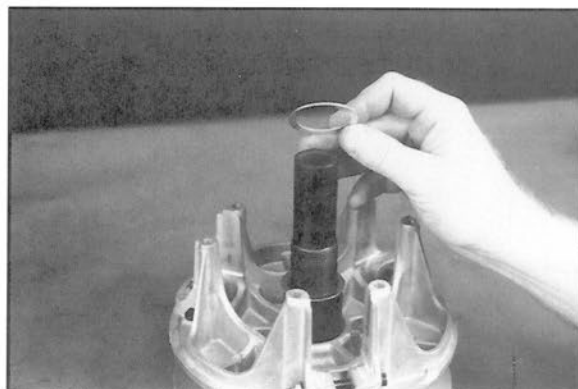
NOTE: In order to maintain proper belt-to-sheave clearance and clutch balance, the same washers (or equivalent total thickness) must be reinstalled during assembly. If sheaves are not marked, or if total thickness of existing shim washers under spider is not recorded, clutch will be out of balance when reassembled and must be replaced. Be sure to follow indexing procedure on page 5.24 if belt-to-sheave clearance is being adjusted.

6. Inspect both sheave surfaces for wear or damage. Inspect movable sheave bushing. See page 5.41 for inspection and repair procedure.

7. Using an 1/8" Allen wrench with a 3/8" combination wrench, remove drive clutch fly weights. Note direction of weight pin with nut on trailing side. Inspect each weight. Surface should be smooth, with no waves or galling. Place bolt inside weight to check flyweight bushing and pin surface for wear.

NOTE: The weight bushing is not a service part and both weight and pin must be replaced if worn.

8. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Roller can also be inspected by rolling with finger to feel for flat spots, roughness, or loose bushing. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Replace roller and pin if roller fails to roll smoothly (flat spots) or if bushing is loose.



CLUTCHES

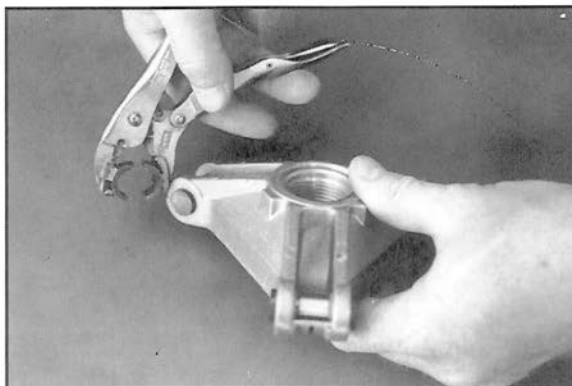
Drive Clutch

Spider Roller Removal

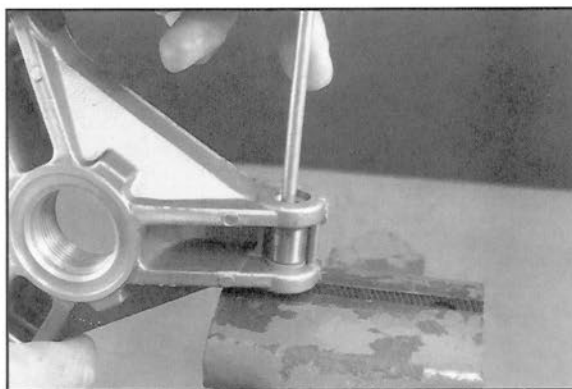
1. Remove spider buttons using button removal tool. Remove shims (if any are installed) and note location.

Spider Button Removal Tool

PN 2870985

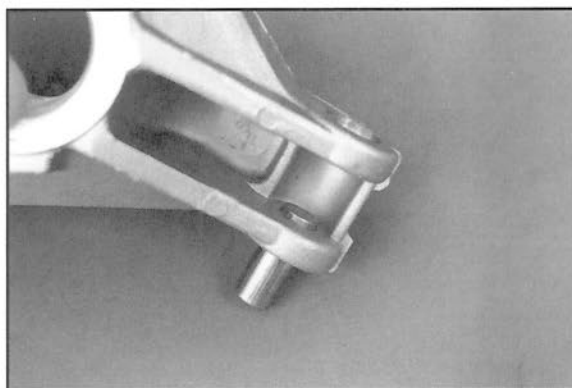


2. Place spider on a vise or in an arbor press. Using a pin punch, drive out the roller pin.

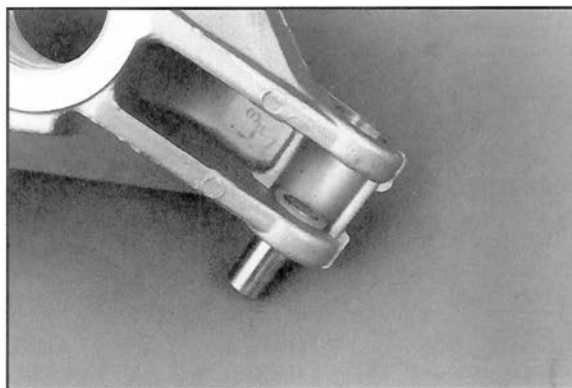


Roller Installation

1. Start a replacement roller on each leg, driving a pin in .100"-.125" (.25-.32 cm) beyond the first land of the spider leg (A). Remove any aluminum burrs from pin protruding from spider.

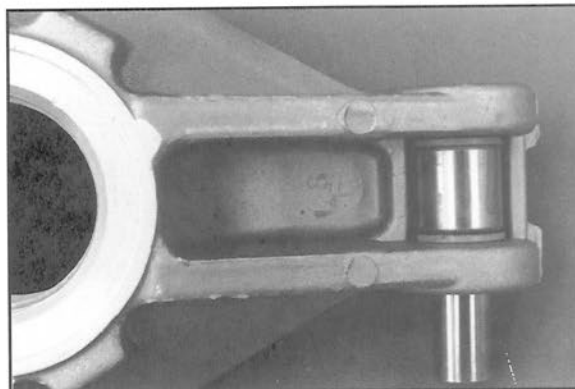


2. Install one washer onto pin.



Roller Installation, Cont.

3. Place roller on pin as it protrudes from first land.
4. Place a second washer on other side of roller.



5. Install service tool as shown.

6. Place spider on a vise anvil and drive roller pin through to second land of spider.

CAUTION:

Use care to start the pin straight. Aluminum burrs could pass through into the roller bushing causing it to bind and stick. Also use care to make sure the roller remains aligned when the pin is driven through. The roller bushing could be damaged causing premature wear and roller failure.



Spider Button Shimming

1. Determine how many shims are to be used.

NOTE: A shim kit is available which contains an assortment of shims, including .002", .005", and .010".

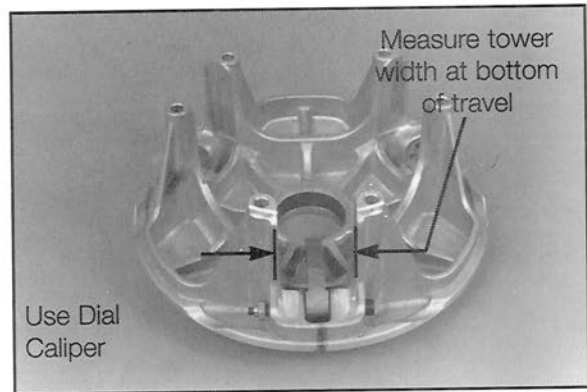
Shim Kit PN 2200387

CLUTCHES

Drive Clutch

Spider Button Shimming, Cont.

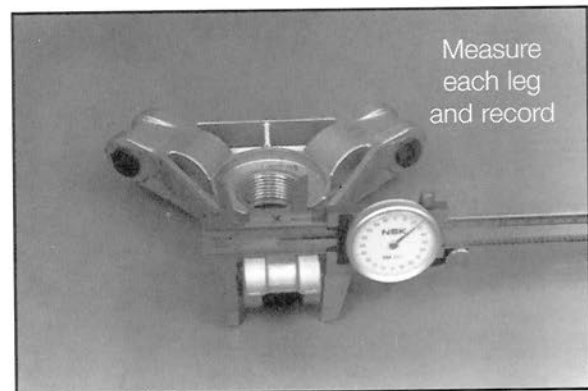
2. Measure the dimension between towers at the lower half of the towers as shown.



3. Install spider buttons using a soft face hammer.

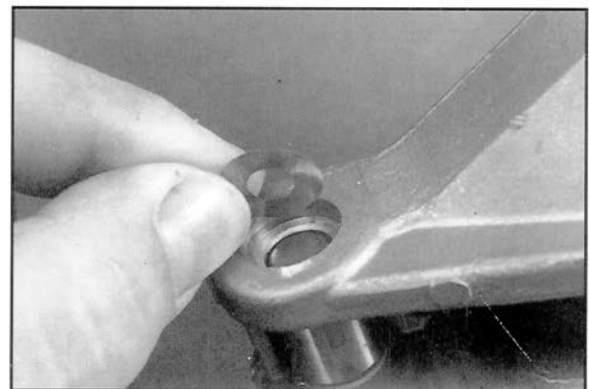


4. Record width of spider buttons on each leg.



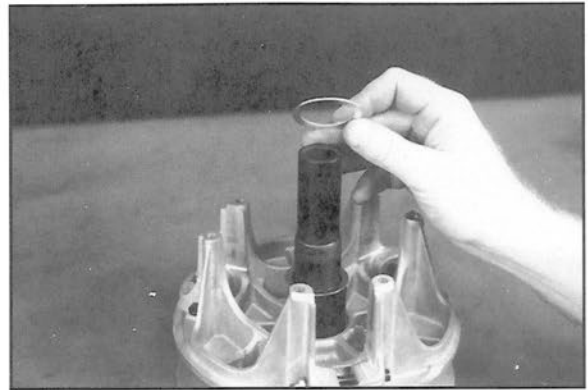
5. Add shims beneath trailing side spider button to obtain specified button-to-tower clearance when assembled.

Button to Tower Clearance -
P-85 / P-90 = .002" (.05 mm)



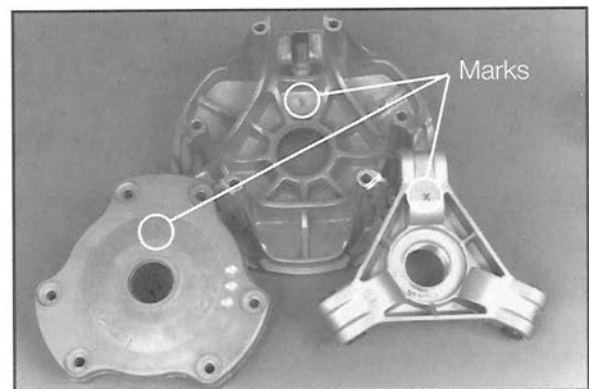
Drive Clutch Assembly

1. Place the correct number of spacer washers beneath the spider.



2. Assemble clutch making sure "X" marks on movable sheave and spider, or reference marks made before disassembly are aligned to achieve proper balance.

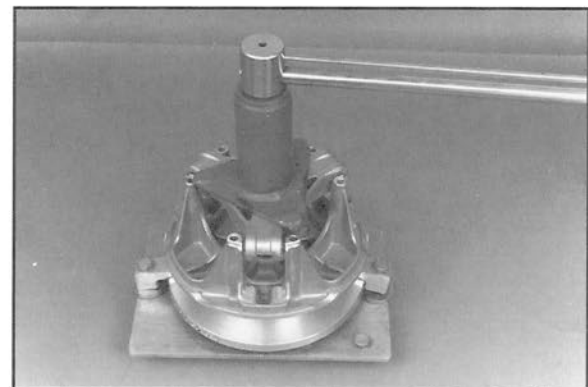
NOTE: If belt to sheave clearance is being changed by adding or removing washers from under the spider, and the sheaves were marked before disassembly, follow indexing procedure on page 5.24.



3. Torque spider to specification.

Spider Torque - P85 and P90
200 ft. lbs. (27.6 kgm)

Spider Removal Tool
PN 2870341

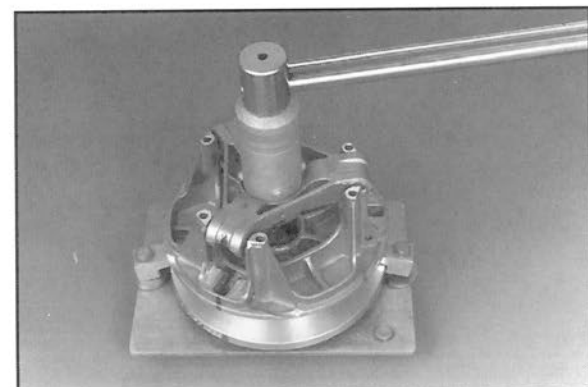


4. Torque jam nut to specification (P-85 Clutches). Install weights with weight pin nut on trailing side. Use new nuts to ensure proper retention. Torque nut to 30 in. lbs.

Jam Nut Torque - P85 models only
235 ft. lbs. (32.43 kgm)

Jam Nut Tool
PN 2870338

Weight Pin Nut Torque
30 In. Lbs. (.34 kgm)



CLUTCHES

Drive Clutch

Assembly, Cont.

5. Install spring and cover. Torque cover bolts evenly to specification.

CAUTION: Carefully align bushing with shaft during installation of cover to prevent bushing damage. Maintain alignment by tightening cover bolts evenly and carefully.

Spider Cover Bolt Torque -

90 in. lbs. (1.03 kgm)

Installation

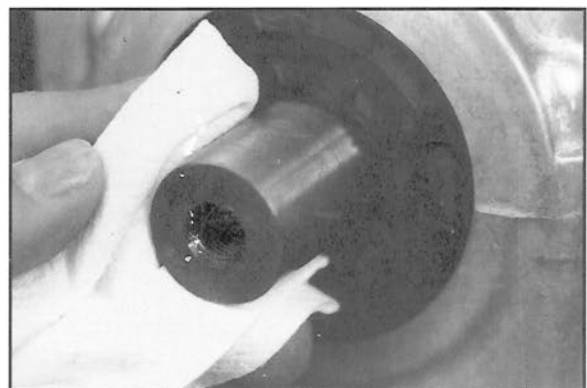
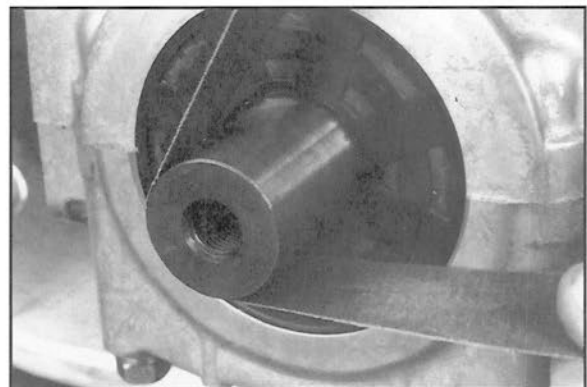
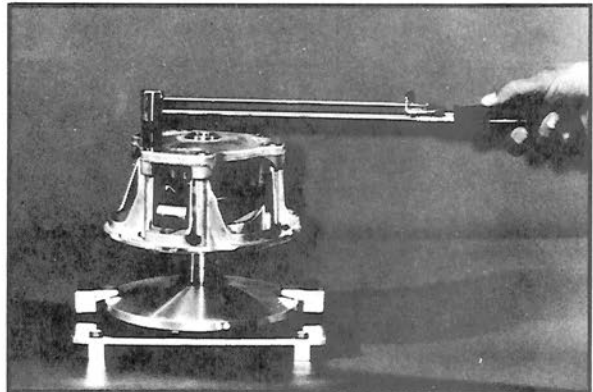
1. Slight galling or scoring of the bore taper can usually be corrected using a tapered reamer. Place reamer in a vise and lubricate with cutting oil. Clean taper by manually rotating clutch clockwise.

Tapered Reamer PN 2870576

2. Check crankshaft taper for galling or scoring. If necessary clean taper evenly with 200 grit emery cloth.

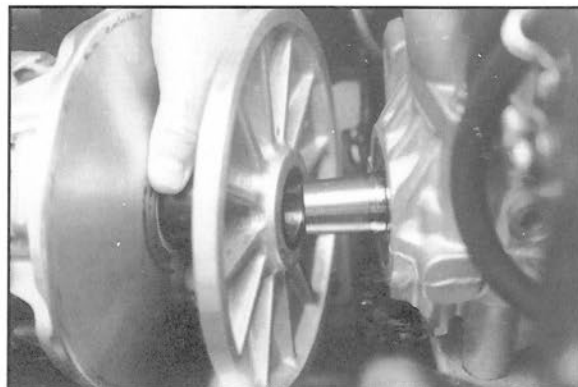
3. Both clutch taper and crankshaft taper should be clean and dry.

NOTE: Do not use harsh cleaners which may cause clutch taper to corrode during use. This will cause difficulty when removing clutch in future. Clean clutch taper with lacquer thinner or isopropyl alcohol.

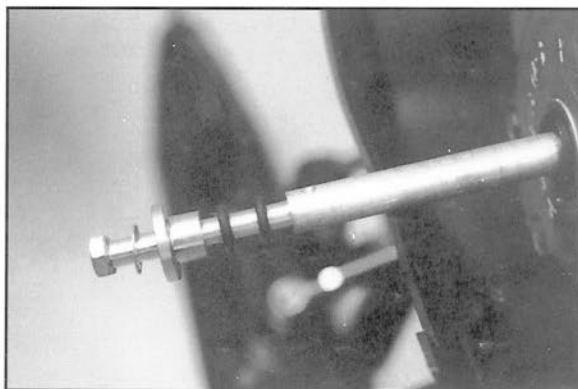


Installation, Cont.

4. Slide clutch fully onto crankshaft taper.



5. Install retaining bolt with any spacers, washers or O-rings. See appropriate parts manual for type and placement of retaining bolt components.

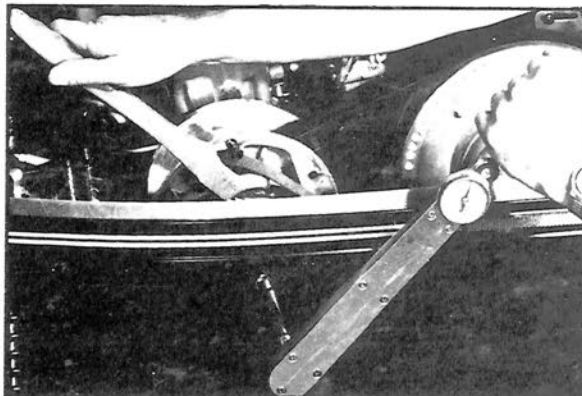


6. Torque retaining bolt to specifications. Hold clutch with strap wrench.

**Drive Clutch Bolt Torque (Large ID Shaft)-
(3/4") 40 - 45 ft. lbs (5.52 - 6.21 kgm)**

**Drive Clutch Bolt Torque (Small ID Shaft)-
(14mm / 7/16") 50 ft lbs. (6.9 kgm)**

NOTE: Re-torque clutch to specification after first period of operation (such as a test ride).



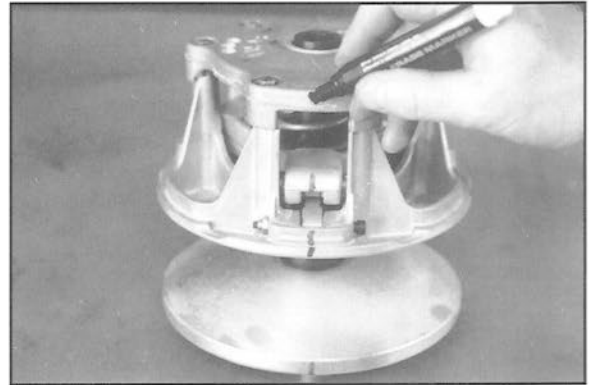
CLUTCHES

Drive Clutch

Spider Indexing

NOTE: Spider indexing affects clutch balance and belt to sheave clearance. Read procedures carefully before proceeding.

1. Before disassembling drive clutch, mark spider, cover, moveable sheave, and stationary sheave in line with a permanent marker as shown.
2. Disassemble drive clutch as described on page 5.16. Take care to note the amount and thickness of the shim washers under the spider.

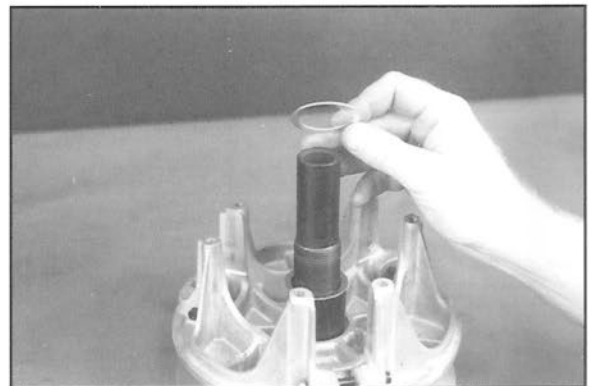


3. Add or remove spider washers as required to achieve desired belt to sheave clearance.
 - For example: If belt to sheave clearance is .020" too large, removing one .020" shim will position the movable sheave closer to the fixed sheave reducing belt to sheave clearance by .020".

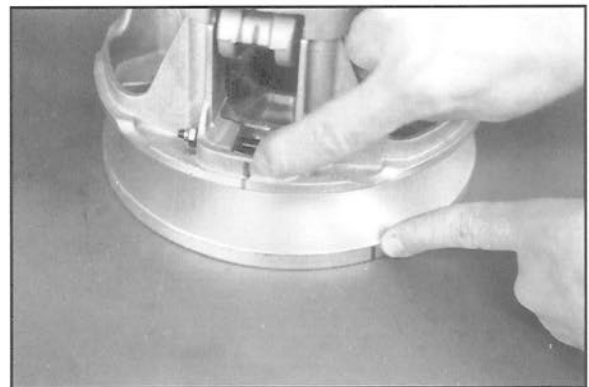
NOTE: The following washers are available for fine tuning:

Washers:

PN 5210754	.050"
PN 5210753	.032"
PN 5210752	.020"



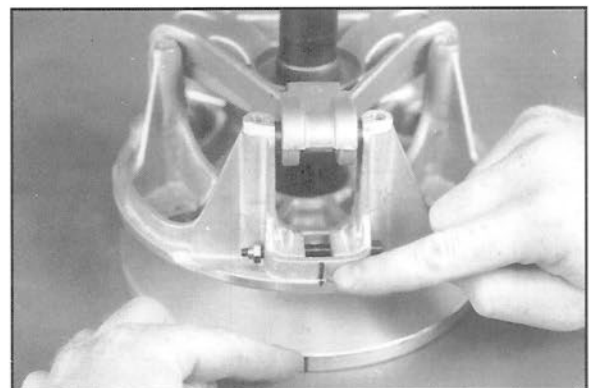
4. Install spider washer(s) and spider aligning Xs. Notice as the spider seat location is changed, the sheave marks made before disassembly no longer align. There are two ways to bring the sheave marks into alignment.
 - Vary the amount and thickness of spacer washers (Washer thickness may vary slightly).
 - Re-index marked spider leg to another tower. This can be done because spider has little effect on overall clutch balance.



Re-indexing the spider 1/3 turn clockwise, or 1 leg, will allow the realignment of the moveable and stationary sheaves as previously marked. For example:

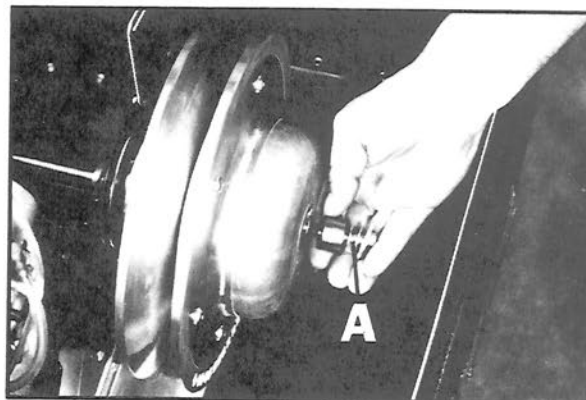
- .020" or .032" washer removed - re-index spider clockwise 1/3 turn
- .050" or .064" washer removed - re-index spider clockwise 1/3 turn
- Two .050" or .064" washers removed - re-index clockwise 2/3 turn

NOTE: Alignment marks should be within 1" (25 mm) after final assembly and torquing.



Driven Clutch Removal

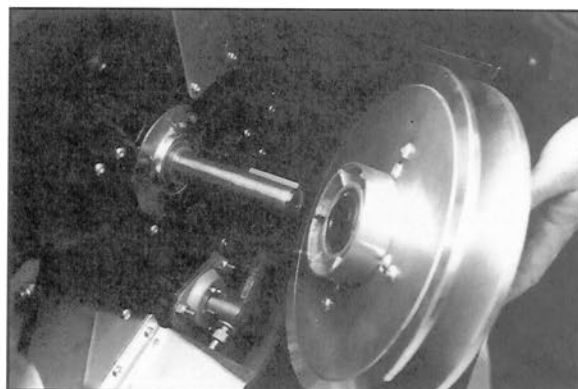
1. Remove driven clutch retaining bolt.



2. Slide driven clutch off jackshaft. It may be necessary to use a puller on some driven clutches. P-85 clutches (externally adjustable) can be removed using a 3-point flywheel or steering wheel puller and the 1/4-20 adjustment bolt holes. Use a suitable spacer on the end of the jackshaft.

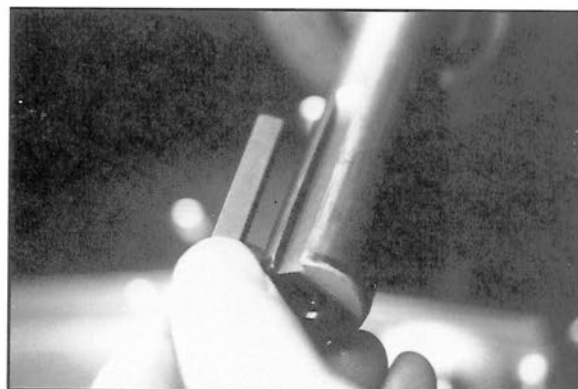
P-90 Driven Clutch Puller

PN 2871056



3. Inspect jackshaft keyway (splines / P-90s) for wear or damage.

NOTE: Notice the number and thickness of shim washers between driven clutch and jackshaft bearing. These must be replaced to maintain proper offset/alignment.



CLUTCHES

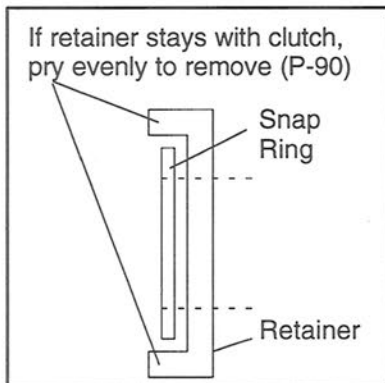
Driven Clutch

Disassembly

1. Place clutch on bench.

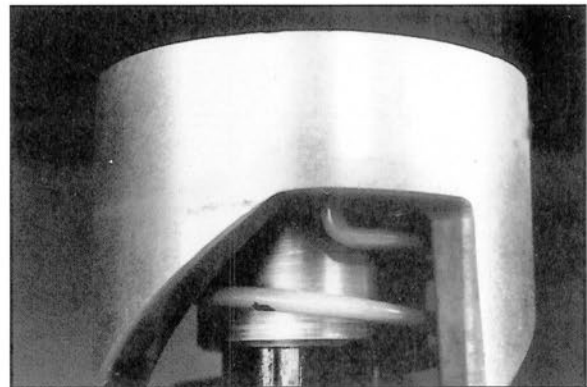
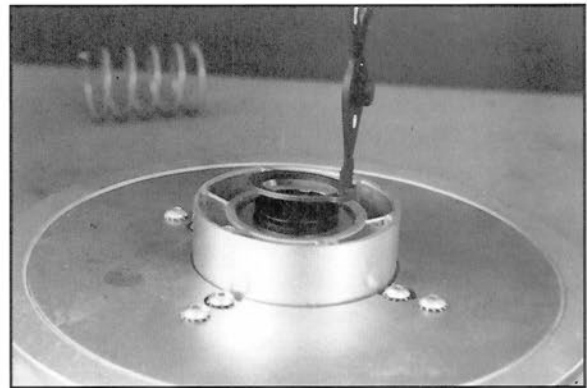
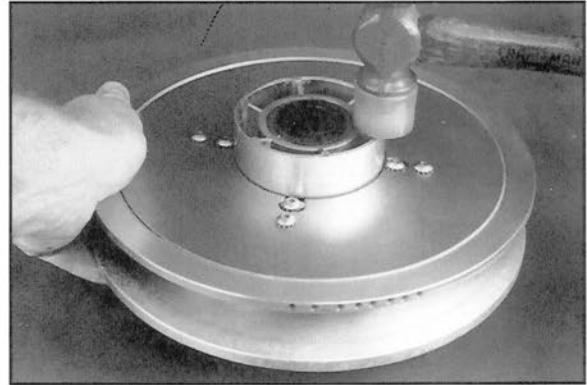
CAUTION: Wear eye protection during disassembly and assembly of driven clutch.

2. Hold fixed sheave and turn movable sheave 1/4 turn. Hold movable in place tap helix down with a soft faced hammer. Remove snap ring and washer. **NOTE:** On models equipped with snap ring retainers as shown below, retainer may stay on back of snap ring when clutch is removed. Pry lightly to remove retainer and gain access to snap ring. (Refer to illustration below.)



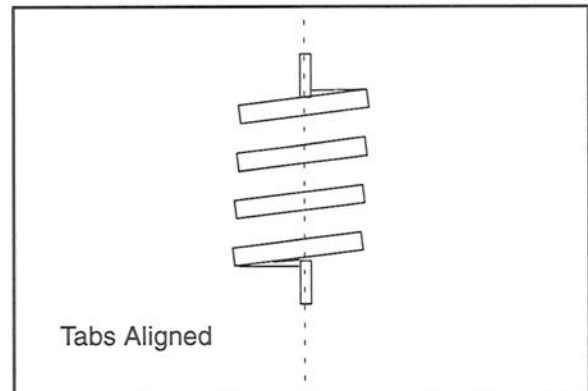
3. Allow sheaves to return and force the helix out. Before removing helix, note driven clutch spring position. Remove helix.

4. Inspect helix ramps and movable buttons and for wear or damage. P-90 driven clutch ramp buttons are secured by Torx™ screws. P-85 buttons can be removed by applying heat to the button housing or drill button with an 1/8" drill bit. The ramp buttons should be replaced when worn. See Maintenance section for inspection intervals.

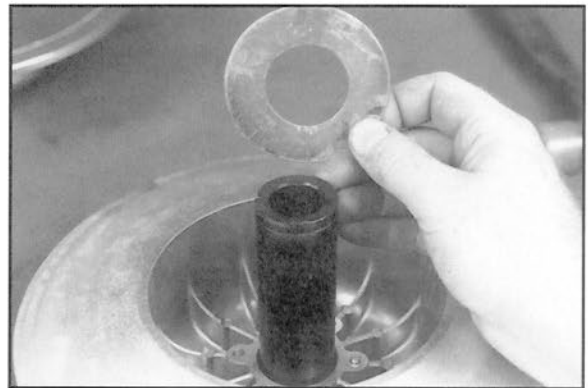


Disassembly, Cont.

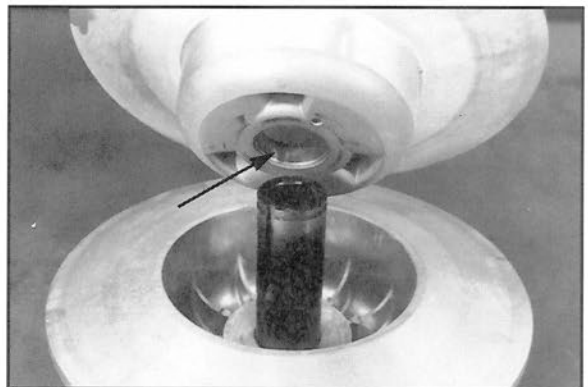
5. Remove driven clutch spring. Both spring tabs should line up. If not spring is fatigued and should be replaced.



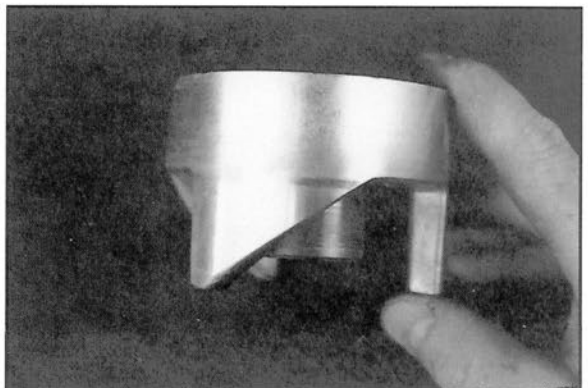
6. Slide moveable sheave off and inspect sheave surfaces for wear or grooving. Note size and number of shim washers between sheaves.



7. Note condition of moveable sheave bushing. Install helix into bushing. It should slide freely without binding. See page 5.43 for bushing replacement.



8. Polish helix with a fine emery cloth to remove any sharp edges or build up which may cause sticking.



CLUTCHES

Driven Clutch

Assembly

1. Install appropriate washer(s) on fixed shaft.

Optional Thin Adjustment Washer (P-85)

.048" - PN 7555899



2. Slide moveable sheave on fixed shaft.



3. Install driven clutch spring. Be sure spring tab is seated in hole in moveable sheave. Refer to specifications in front of this section for driven spring setting.

- **P-85** driven clutches have 1 spring locating hole in the moveable sheave and 4 holes in the helix.
- **P-90** driven clutches have 2 spring locating holes in the moveable sheave, and 3 in the helix

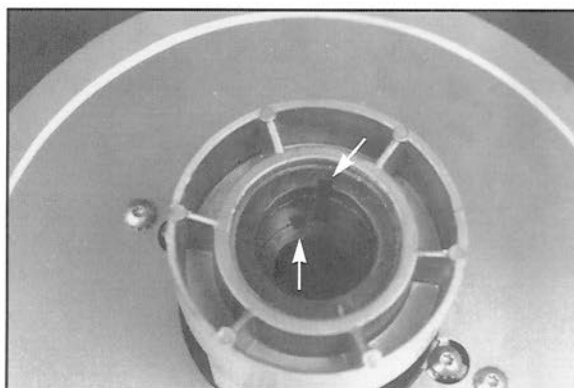
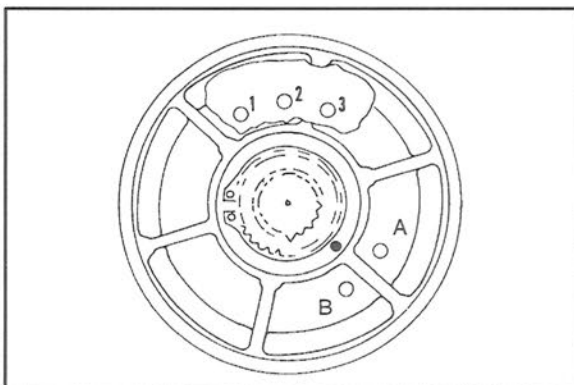
NOTE: The driven clutch helix/moveable assembly has several different spring locations which affect clutch shifting and RPMs. Tighter spring tension will raise engine RPMs during clutch upshift and allow quicker downshift when pulling or negotiating a hill. The lighter tension positions will tend to have a slower downshift and a harder up-shift.

P-90

Example:	Helix	Moveable Sheave	Spring Tension
	B	- 1	Heavy
Spring/	B	- 2	
Position	A	- 1	
	B	- 3	
	A	- 2	
	A	- 3	Soft

P-90 production settings are usually B2
P-85 production settings are usually #2

4. Align inner keyway (P-85) or boss spline (P-90) between the helix and moveable sheave. With the spring in place, slide helix onto shaft .5" (12mm).



Assembly, Cont.

Helix Angles and Effects

The driven clutch helix was selected for overall performance in relation to the other driven system components. In fine tuning situations requiring a slight adjustment of engine operating RPM or improved backshift, we recommend trying a helix change before changing other components.

Polaris has several helix angles available for the P-85 and P-90 driven clutch. Refer to the chart below for specific angle effects and identification.

Helix Ramps*

Description	PN	Degrees	Type
34	5130896	34	P85
34M*	5130751	34	P85
36	5130895	36	P85
36M*	5130717	36	P85
38	5130723	38	P85
40	5130724	40	P85
42	5130725	42	P85
44	5130726	44	P85
40-36*	5130898	40-36	P85
R1*	5131287	40-32	P85
R2*	5131288	42-32	P85
R3*	5131289	45-32	P85
R4*	5131290	50-32	P85
R5*	5131291	40-34	P85
R6*	5131292	42-34	P85
R7*	5131293	45-34	P85
R8*	5131294	50-34	P85
R9*	5131295	40-36	P85
R10*	5131296	42-36	P85
R11*	5131297	45-36	P85
R32*	5131623	50-34	P85
R12*	5131298	50-36	P85
T-1*	5131013	42-36-34	P-85
36.5	5130383	36.5	P90
40-38-36	5131161	40-38-36	P90
38-36	5131162	38-36	P90
38-36-34	5131163	38-36-34	P90
34	5131164	34	P90

The helix spring should always be adjusted within its limits before a helix change is performed. The normal rate of change between helix angle steps is 250 RPM under full throttle. This is approximately the same result as in going from the No. 1 to No. 4 spring position (P-85).

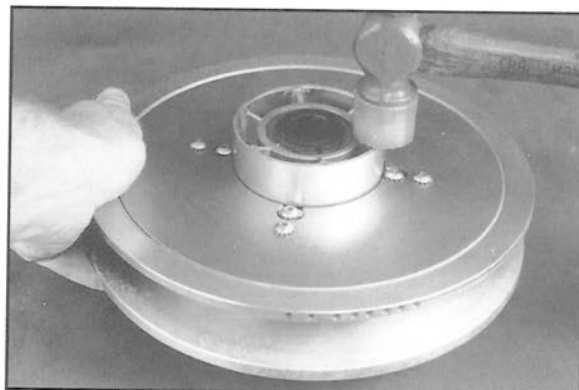
NOTE: Increasing spring tension increases engine RPM. RPM changes may not be evident if other drive or driven clutch components are substandard.

* **NOTE:** All R-Series, Mod(M), T1, and 40-36 helix ramps are cut 0.060" deeper in the snap ring pocket. These are made so the driven clutch can open far enough for full shift out with wide 1 7/16" belts (standard on Storm and 600/700 twins).

If these helix ramps are used with narrow belts, 2 (two) additional (for a total of three) .030" / .8 mm washers (PN 7556804) should be installed under the snap ring to prevent the belt from touching the inner hub at full shift which can cause belt failure.

Wide belt models (Storm and 600&700 twins) use only the existing washer under the snap ring.

5. Hold fixed sheave and turn movable sheave 1/4 turn counterclockwise.
6. Force helix down into place, exposing snap ring groove.

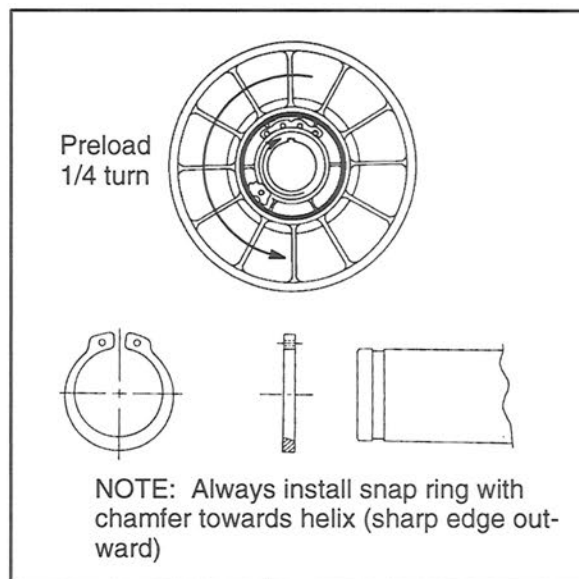
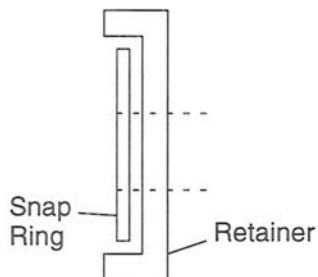


CLUTCHES

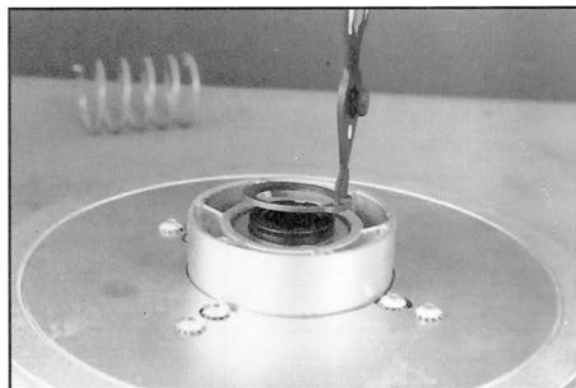
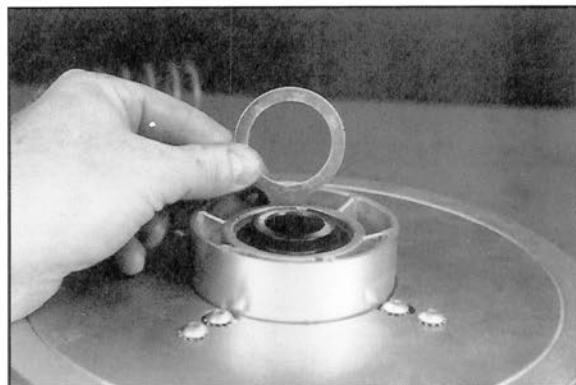
Driven Clutch

Assembly, Cont.

7. Install retainer (where applicable on P-90) spacer washer(s), and snap ring. Snap ring should be installed with flat (machined) side up or toward jackshaft bearing. **NOTE:** On models equipped with snap ring retainers as shown below, retainer may stay on back of snap ring when clutch is removed. Pry lightly to remove retainer and gain access to snap ring. (Refer to illustration below.)



8. Allow sheaves to close. Test clutch by pre-loading movable sheave 1/4 turn counterclockwise and releasing. Sheave should open and close smoothly with a positive stop. Some helix ramps have more than one washer beneath the snap ring. Refer to page 6.37 for more information.



Installation

1. Install proper number of spacer washers on jackshaft between clutch and jackshaft bearing.

Inspect Jackshaft Bearing

Excessive vibration or abnormal drive belt wear can be caused by a worn bearing or jackshaft on the driven clutch side. To inspect bearing fit, watch the bearing area closely as you try to force the jackshaft up and down. If movement is detected, disassemble to determine which parts are worn. Replace the jackshaft if the new bearing is loose on the shaft. The bearing should be greased at 1000 mile (1600 km) intervals and before storage.

NOTE: Spacer washers between driven clutch and jackshaft bearing set the offset. Refer to adjustment procedure on page 5.36 to adjust offset between the drive and driven clutch.

2. Lightly grease jackshaft keyway or spline. With square key in place (P-85s) slide clutch onto jackshaft.

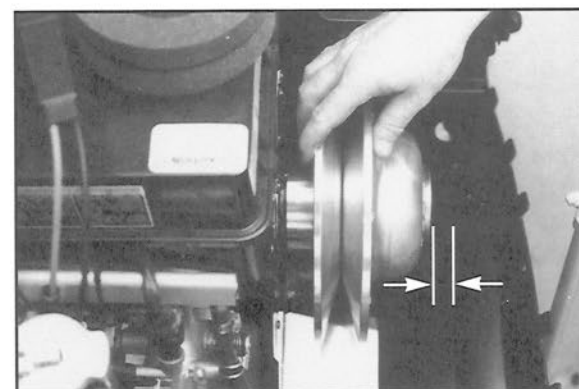
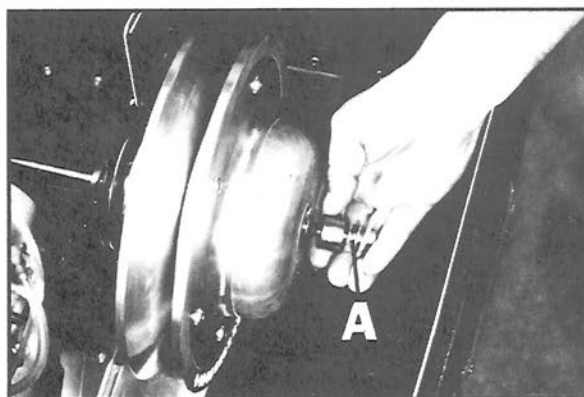
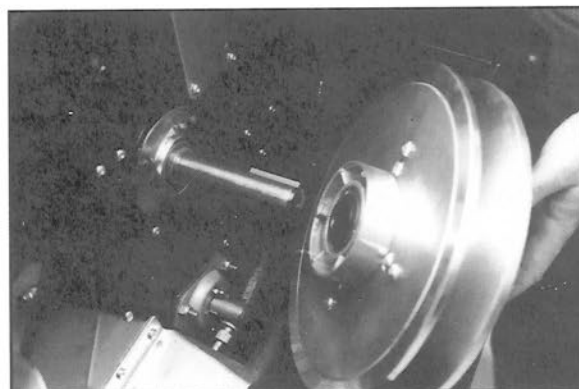
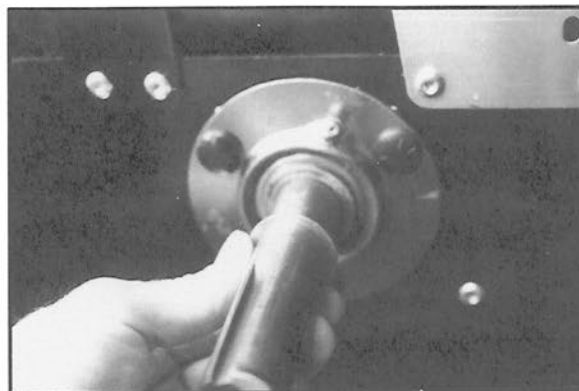
3. Install spacer, bolt and washer to hold driven clutch in place.

Driven Clutch Retaining Bolt Torque-
15 ft. lbs. (2.08 kg-m)

4. P-85 and P-90 driven clutches should float from side to side (.040-.080" (1-2 mm)). Without a slight free float, jackshaft bearings could be side loaded, causing premature bearing failure. **NOTE:** Some models with P-90 clutches use a snap ring retainer cup to captivate the snap ring. On these models end float should be adjusted between .000 and .010" (.000-.254 mm) Torque bolt to specification.

Driven Clutch Torque/Float

P-85 / P-90 - .040-.080" (1-2 mm)
P-90 with retainer .000-.010" (.000-.254 mm)



CLUTCHES

Drive Belt

Drive Belt

Part No.	Belt Width* (Projected)	Side Angle Overall*	Center to Center* +.100" - .000"	Outer Circum- ference*	Notes
3211042	1.375" (34.93mm)	32°	12.00"	47.250"	Common production belt for P-85 systems
3211045	1.375" (34.93mm)	32°	12.00"	47.125"	Close tolerance version of 3211042
3211058	1.250" (31.75mm)	28°	11.00"	43.313"	Indy Lite belt (P-90)
3211059	1.250" (31.75mm)	28°	12.00"	45.125"	Longer Indy Sport Belt (P-90)
3211061	1.375" (34.93mm)	32°	12.00"	47.188"	CVT version of 3211045
3211065	1.438" (36.53mm)	28°	12.50"	48.375"	CVT Double Cog Storm belt
3211066	1.375" (34.93mm)	28°	12.00"	47.250"	Double cog - CVT - thicker than 3211070. Production on higher horsepower snowmobiles.
3211067	1.375" (34.93mm)	28°	12.00"	47.250"	Double cog—Good for short runs on higher horsepower engines (Drag Racers) - Good for lower horsepower trail riding
3211070	1.375" (34.93mm)	28°	12.00"	47.250"	Common production belt for late model P-85 systems 1997-current.
3211073	1.438" (36.52mm)	28°	12.50"	48.375"	Double cog—Good for short runs on higher horsepower engines (Drag Racers) - Good for lower horsepower trail riding
3211074	1.438" (36.52mm)	28°	12.00"	47.625"	Double cog—Good for short runs on higher horsepower engines (Drag Racers) - Good for lower horsepower trail riding
3211075	1.438" (36.52mm)	28°	12.00"	47.625"	Double cog - CVT

*± **Belt dimensions given are nominal dimensions.** There is a ± variance for all critical dimensions. Clutch set-up must be inspected when a new belt is installed and, If necessary, clutch set-up must be adjusted.

The drive belt is an important component of the converter system. In order to achieve maximum efficiency from the converter, drive belt tension (deflection), clutch offset, and alignment must be adjusted properly.

General Belt Selection Guidelines

NOTE: Refer to appropriate parts manual for proper belt. Production belt is recommended unless tuning for a specific application.

CVT

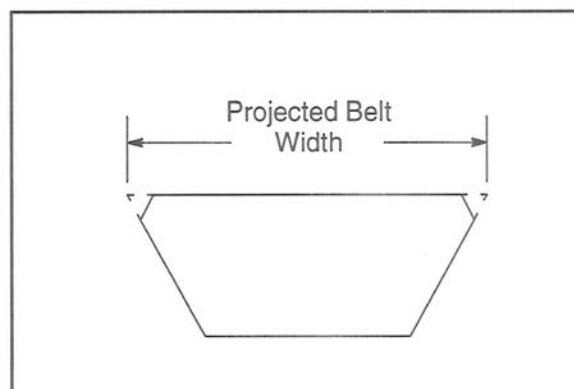
- Increased service life for high horsepower and extended high speed running
- Need 1-2 grams heavier drive clutch weight
- Good for prolonged high speed running.
- Good for aggressive riders

Standard Compound

- More aggressive at low speeds
- Reduced heat and drive clutch sheave wear
- Used for short, higher horsepower runs (Drag Racing)
- Good trail belt for lower horsepower engines.

Drive Belt Inspection

1. Measure belt width and replace if worn severely. Generally, belt should be replaced if clutches can no longer be adjusted to provide proper belt deflection.
 - The top edges have been trimmed on some drive belts. It will be necessary to project the side profiles and measure from corner to corner.
 - Place a straight edge on each side of the drive belt.
 - Place another straight edge on top of belt.
 - Measure the distance where the side straight edges intersect the top, as shown in the illustration at right.
2. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
3. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt.



Belt Wear / Burn Diagnosis

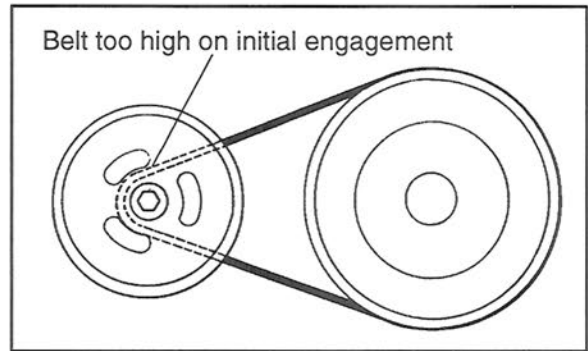
Belt Wear / Burn Diagnosis	
Possible Cause Of Wear Or Burning	Solution
Driving at or about engagement RPM for extended periods in all types of conditions	Drive at higher RPM if possible. Gear the machine down. Make sure belt deflection is at 1.25" to achieve optimum starting ratio
Cold weather startups	Be patient. Warm up engine at least 5 minutes or until it readily responds to throttle input. For the quickest most efficient driveaway in extreme cold weather, take drive belt off machine and bring it in to a warm environment. Break skis and track loose from the snow. Engage throttle aggressively for short durations for initial cold drive-away
Towing another machine at or about engagement RPM	When possible, do not go in deep snow when towing another machine. Use fast, effective throttle to engage the clutch. Not all machines are intended for pulling heavy loads or other machines.
Spinning track while vehicle is stuck (high RPM, low vehicle speed, high ambient temp. Example: 8000 RPM, 10mph vehicle speed, 60 mph indicated on speedometer.	Lower the gear ratio. Remove windage plates from driven clutch. If possible, move to better snow conditions and reduce RPM. Avoid riding in very high ambient temperatures.
Ice and snow piled up between track and tunnel overnight or after stopping for a long period of time (enough to re-freeze the snow).	Break loose snow and ice under tunnel. Allow longer than normal warmup. Allow belt to warm sufficiently and increase grip ability on clutch sheaves. Use fast, effective throttle when engaging clutch.
Poor running engine (Bog, Miss, Backfire, etc.)	Maintain good state of tune including throttle and choke synchronization. Check for fouled spark plug(s). Check for foreign material in carbs. Make sure no water or ice in fuel tank, lines, or carburetors.
Loading machine on trailer	Use caution when loading machine. Carbide skags may gouge into trailer and prevent drive train from spinning freely. Use enough speed to drive completely onto trailer. If machine cannot be driven completely onto trailer, it may need to be pulled or pushed to avoid belt wear / burning.
Clutch malfunction	Check for correct clutch components.
Slow, easy belt engagement – easing on the throttle	Use fast, effective throttle to engage the clutch.

CLUTCHES

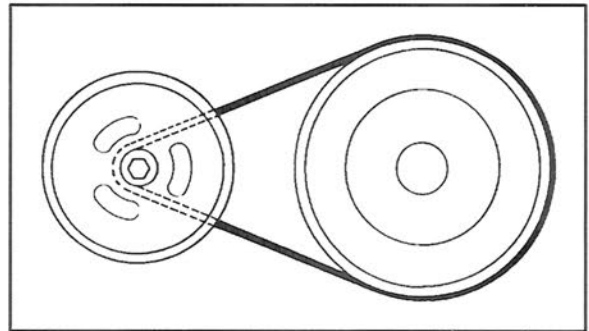
Drive Belt

Belt Deflection

Too much belt deflection - If the belt is too long or the center distance too short, the initial starting ratio will be too high, resulting in performance loss. This is due to the belt rising too high in the drive clutch sheaves upon engagement.



Not enough belt deflection (belt too tight) - If the drive belt is too short or the center distance too long, the ratio will again be incorrect. In addition, the machine may creep when the engine idles, causing damage to the internal face of the drive belt.



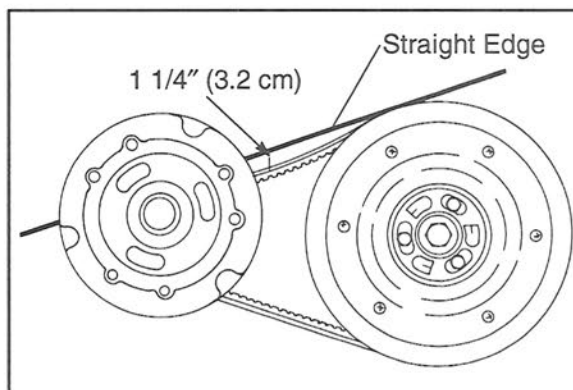
Measuring Belt Deflection

IMPORTANT NOTE: Do not apply excessive pressure to force belt into driven sheaves. This will result in an improper measurement. If belt deflection cannot be adjusted within specification using methods below, inspect center distance and compare to specifications beginning on page 6.3.

1. Measure belt deflection with both clutches at rest and in their full neutral position.
2. Place a straight edge on the belt and apply downward pressure while measuring at the point shown.

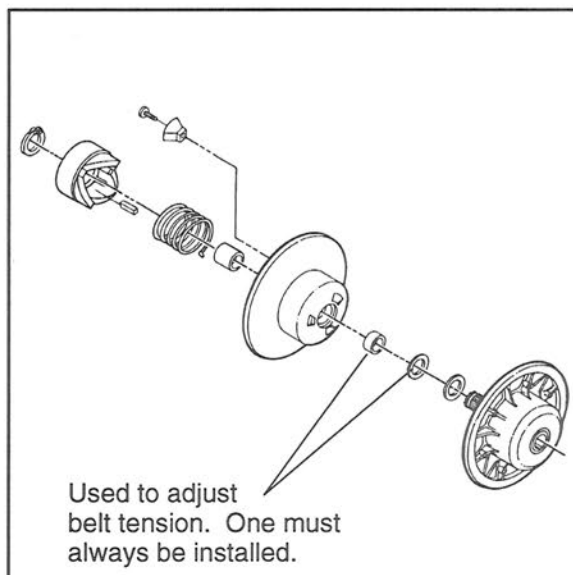
Belt Deflection -

1 1/4" (3.2 cm)



Adjusting Belt Deflection (P-90)

1. Belt deflection on P-90 clutches is controlled by adding or removing shim washers from between the driven clutch sheaves. To change belt deflection, disassemble clutch as outlined on page 5.26.
2. Adjust shim stack between clutches to achieve desired belt deflection. At least 1 washer must remain between clutch sheave.
 - Remove washers to decrease belt deflection
 - Add washers to Increase belt deflection
3. Reassemble clutch as outlined on page 5.28.



Adjusting Belt Deflection (P-85)

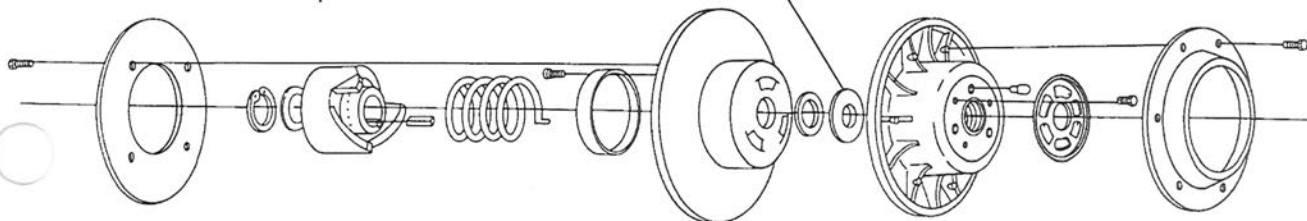
Belt deflection can be adjusted without removing the clutch from the jackshaft.

1. Pull belt into driven clutch to slightly open sheaves.
2. Loosen three bolts on adjustment cam.
3. Turn cam counterclockwise to reduce distance between sheaves. *Do not* rotate past #1 position.
4. Torque bolts to specification.

Optional Thin Adjustment Washer (P-85)

.048" - PN 7555899

Production washer is usually .075" thick with other .020 or .030 washers as required. May use optional, thinner (.048") washer PN 7555899 if required to obtain proper sheave width. Either the .075" or .048" washer must be installed in this location to provide support for the adjustment pins.



CLUTCHES

Drive Belt

Clutch Offset Inspection

NOTE: Proper offset aligns the fixed sheaves of both clutch assemblies. This allows the clutches to be aligned throughout the shift range.

1. Remove drive belt. Belt deflection adjustments affect offset. Set belt deflection first.
2. Install proper alignment tool, depending on type of clutch, as shown in Ill. 1.
3. Rear of driven clutch moveable sheave should just contact tool when clutch is pushed inward on jackshaft.

Clutch Alignment (Tools) -

P90 - 21/32" Offset (PN 2870914)
P85 - 5/8" Offset (PN 2870426)

P90 Electric Start -
1.28" Offset (straight edge)
P85 Electric Start -
1" Offset (straight edge)

Clutch Offset Adjustment

1. Determine direction driven clutch needs to be adjusted. (Refer to Clutch Offset Inspection procedure above).
2. Remove driven clutch retaining bolt, and remove driven clutch.
3. Add or take out washers on jackshaft between the driven clutch and jackshaft bearing to achieve proper offset.
4. Most models require the driven clutch to float on the jackshaft. After adjusting offset, add or remove shim washers from the retaining bolt to provide a .030"-.060" (.75-1.5mm) of float on jackshaft. This will prevent side loads on the jackshaft bearing.

NOTE: On models with driven clutch snap ring retainer (Transport, Lite Touring, Sport Touring, etc.) the clutch is mounted firmly on the shaft without float.

NOTE: When checking electric start models, use a straight edge as shown in Ill. 2. If alignment is off, loosen the engine mounts and shift engine as required to obtain the proper offset and alignment.

Driven Clutch Bolt Torque -

12 ft. lbs. (1.66 kgm)

Offset - Non-Electric Start Models

21/32" Offset
All models with P90
driven clutch
5/8" Offset
All models with P85
driven clutch

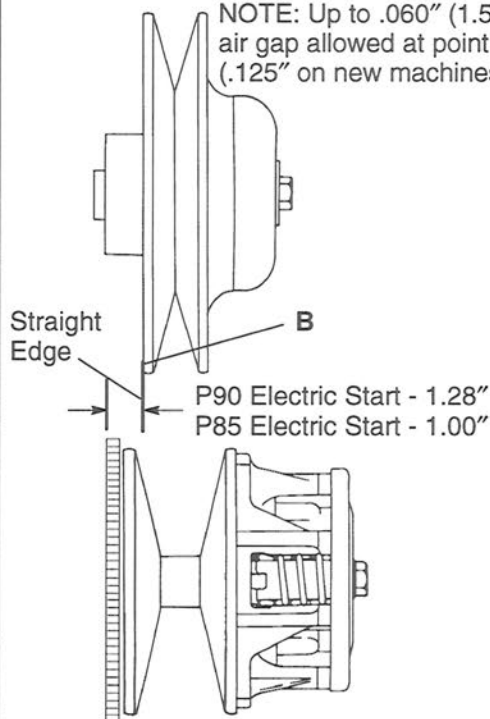


Ill. 1

Offset Alignment Tool

Offset - Electric Start Models

NOTE: Up to .060" (1.5mm) air gap allowed at point "B". (.125" on new machines)



Ill. 2

Clutch Alignment Inspection

NOTE: Drive clutches are purposely misaligned slightly forward to compensate for the engine shifting on it's mounts. Under load, the engine will pull back slightly so both clutches are in alignment.

1. After clutch offset has been verified, inspect alignment.
2. Install proper alignment tool, depending on type of clutch, as shown in Ill. 1 page 5.36.
3. There should be a .060" - .090" (1.5 - 2.25 mm) gap between front of driven clutch and tool, with the tool just touching at the rear. Up to .125" (3.1 mm) gap is acceptable in the front on new machines.

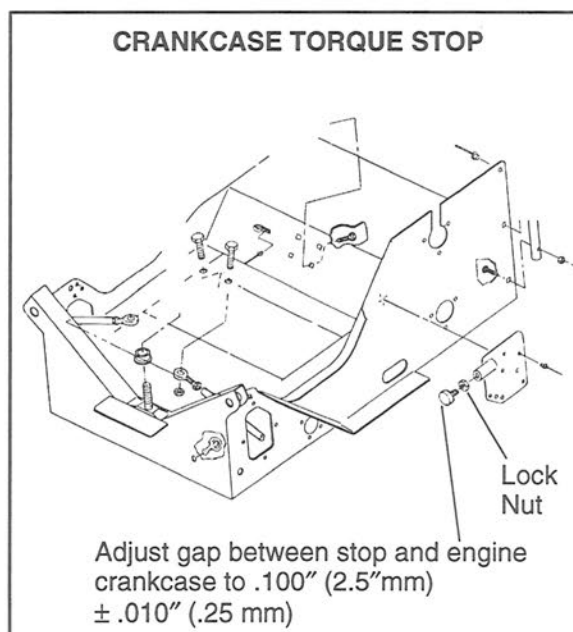
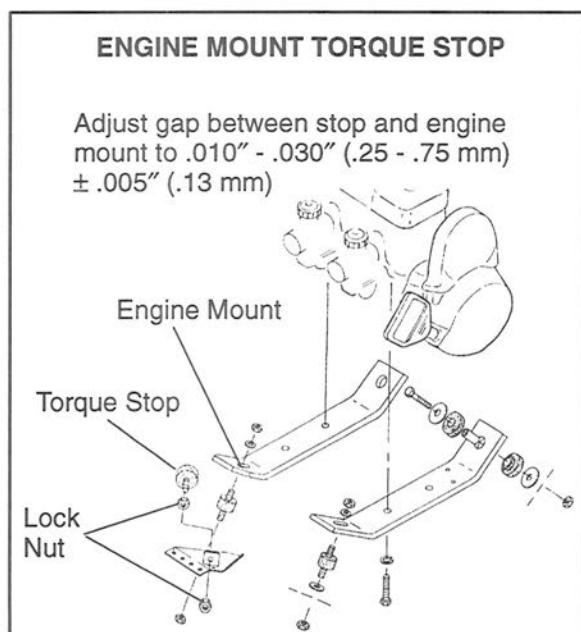
Clutch Alignment Adjustment

1. Loosen all 4 engine mounting bolts.
2. Adjust engine torque stop until clutches are in proper alignment.
3. Tighten engine mounts securely.
4. Recheck both clutch offset and alignment.
5. Verify proper torque stop adjustment.

Torque Stop Adjustment

NOTE: There are two types of torque stops currently used. Refer to the illustrations below for adjustment of each type.

1. After aligning clutches, adjust torque stop by loosening lock nut and rotating stop to proper clearance as shown. Hold torque stop and tighten jam nut to 15-17 ft. lbs. (2.07-2.35 kg-m).



CLUTCHES

Drive Belt

Belt to Sheave Clearance Inspection

NOTE: The distance between the belt and the moveable sheave on the drive clutch is very important. This distance controls the starting ratio (lowest starting ratio is most preferable) and the position of the clutch weight to engine RPM. The distance between the belt and moveable sheave should be as close to .020" (.5 mm) as possible without creating a drag on the belt, when positioned around the hub at the bottom of the sheaves.

1. Force belt to one side of drive clutch. **NOTE:** Measure total belt to sheave clearance with a new belt.
2. Install feeler gage between other sheave and belt.

Belt to Sheave Clearance -
.020" $\pm$.015" (.5 mm $\pm$.4mm)

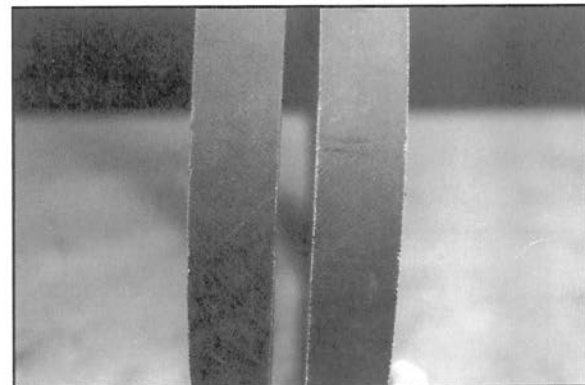
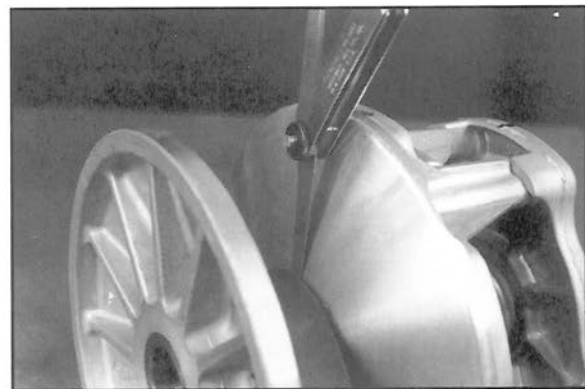
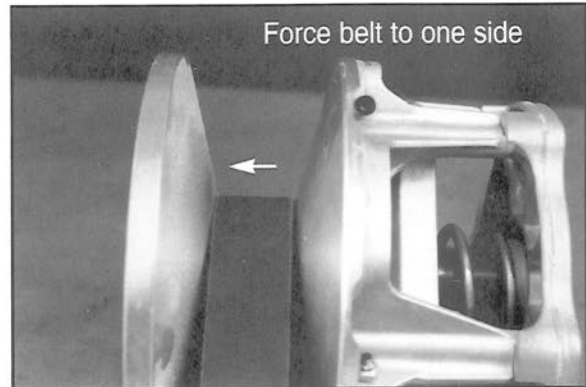
Belt to Sheave Clearance Adjustment

Belt to sheave clearance can be adjusted in two ways.

1. Try several new belts to achieve proper clearance.
2. Can add or remove shims from under the spider to increase or decrease belt to sheave clearance. See Spider indexing on page 5.24.

NOTE: Spider indexing affects clutch balance and belt to sheave clearance. Read procedures carefully before proceeding.

NOTE: Belts with various widths will also affect belt deflection since they will fit differently in the driven clutch. Deflection should be checked per procedure on page 5.35.



CLUTCHES

Clutch Bushing Replacement P-85

Kit PN 2871025

<u>Item</u>	<u>Qty.</u>	<u>Part Description</u>	<u>Part No.</u>
1	1	P-85 Drive Clutch Moveable Bushing Removal and Installation Tool	5020627
2	1	P-90 Drive Clutch and Driven Clutch Bushings Installation Tool	5020628
3	1	Drive Clutch Cover Bushing Removal and Installation Tool (for all drive clutches)	5020629
4	1	P-85 Driven Clutch DU Split Bushing Installation Tool	5020630
5	1	P-90 Driven Clutch Bushing Removal Tool	5020631
6	1	P-85 Driven Moveable Sheave Removal Tool	5130862
7	1	P-85 Driven Moveable Sheave Removal Bridge	5222768
8	1	Main Puller Adapter	5020632
9	1	Adapter Reducer	5010279
10	1	Number Two Puller Adapter	5020633
11	1	Instruction	9912260

You will need to supply:

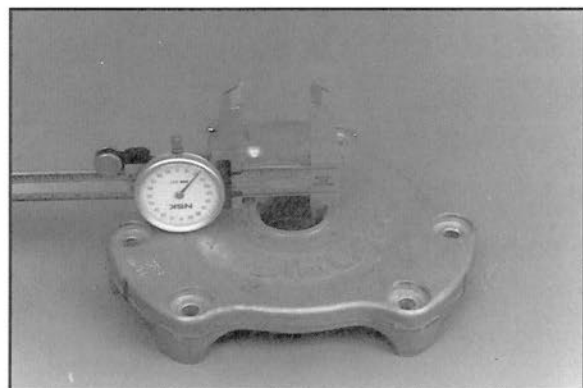
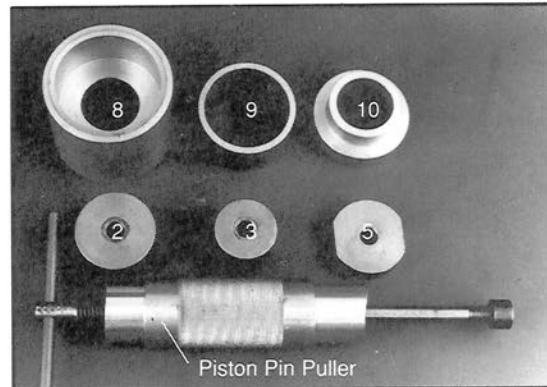
- Piston pin puller (PN 2870386)
- Bench vise
- Soft face hammer (for P-85 Driven Moveable)
- Small scribe or pick (for Cover Bushing Removal)
- Hand held propane torch (for P-90 Driven)
- Loctite RC 860 Retaining Compound (2870584)

P-85 Drive Clutch Cover Bushing Removal

- Disassemble clutch as outlined in this section.
- Inspect or measure bushing and replace if worn beyond service limit. Note: Bushing must be installed in cover. There are two types of bushings used. Refer to the following specifications.

Cover Bushing Inspection:
Garmax™ Style (Installed Dimension)
Nominal Bearing Bore: 1.125" (28.57mm)
Service Limit: 1.140" (28.95mm)

Cover Bushing Inspection:
Teflon/Bronze Style
Service Limit: Replace cover bushing if more bronze than Teflon™ is visible.
Nominal Bearing Bore: 1.125" (28.57mm)
Service Limit: 1.132" (28.75mm)
(Measure When Bushing is Installed)



CLUTCHES

Clutch Bushing Replacement P-85

P-85 Drive Clutch Cover Bushing Removal Cont.

3. On models equipped with snap ring, remove round wire snap ring from inside of clutch cover using a small scribe or pick and set aside.
4. Install main adapter (Item 8) on puller.
5. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
6. With inside of cover toward vise, slide cover onto puller.
7. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
8. Turn clutch cover counterclockwise on puller rod until bushing is removed.
9. Remove nut from puller rod and set aside.
10. Remove bushing and bushing removal tool from puller. Discard bushing.



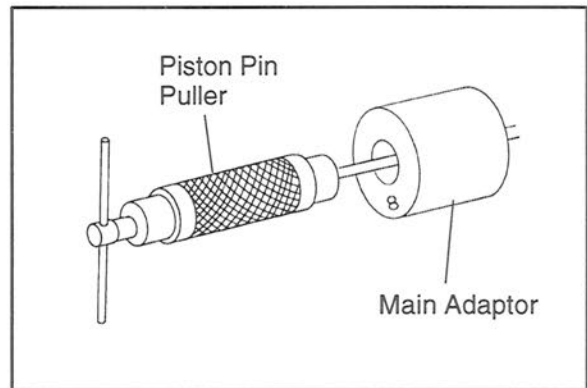
P-85 Drive Clutch Cover Bushing Installation

1. On Garmax™ style bushings (PN 3576516) apply Loctite 680 retaining compound (PN 2870584) to the outer surface of the bushing. Retaining compound is not required on bronze / Teflon™ type bushings (PN 3576510). **Do not lubricate bushings, or premature wear will result.**
2. Working from inside of cover, insert bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
5. Turn clutch cover counterclockwise on puller rod until bushing is seated.
6. Remove nut from puller rod and take installation tool and clutch cover off rod.
7. Squeezing ends of snap ring, gently fit ring into clutch cover.



P-85 Drive Clutch Movable Sheave Bushing Removal

1. Inspect bushing and replace if excessively worn.
2. Install handle end of piston pin puller (PN 2870386) securely into bench vise and lightly grease puller threads.
3. Remove nut from puller rod and set aside.
4. Install main adapter (Item 8) onto puller. See III. 1.
5. Working from inside of moveable sheave, insert removal tool (Item 1) into center of sheave. With towers pointing away from vise, slide sheave onto puller rod.
6. Install nut removed in step 2 onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed.
7. Turn sheave counterclockwise on puller rod until it comes free.
8. Remove nut from puller rod and set aside.
9. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.
10. Remove retaining ring from inside adapter and set aside.



III. 1

CLUTCHES

Clutch Bushing Replacement P-85

P-85 Drive Clutch Movable Sheave Bushing Installation

1. Place main adapter (Item 8) on puller.
2. Push new bushing into center of sheave by hand.
3. Insert installation tool (Item 1) into center of sheave and with towers pointing toward vise, slide sheave onto puller rod.
4. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
5. Turn sheave counterclockwise until bushing is seated.
6. Remove nut from puller rod and set aside.
7. Remove sheave from puller.
8. Remove installation tool.
9. Insert retaining ring removed in step 9 and installation tool into center of sheave.
10. With towers pointing toward vise, install sheave onto puller rod.
11. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
12. Turn sheave counterclockwise until ring is seated.
13. Remove nut from puller rod and set aside.
14. Remove sheave from puller.
15. Remove installation tool. **Do not lubricate bushings, or premature wear will result.**

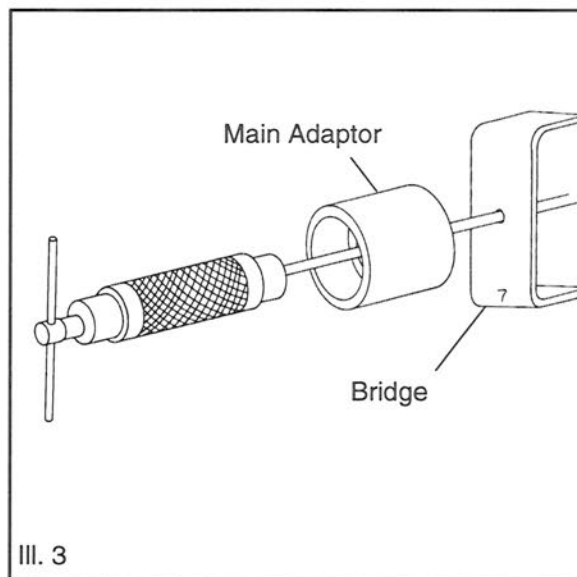
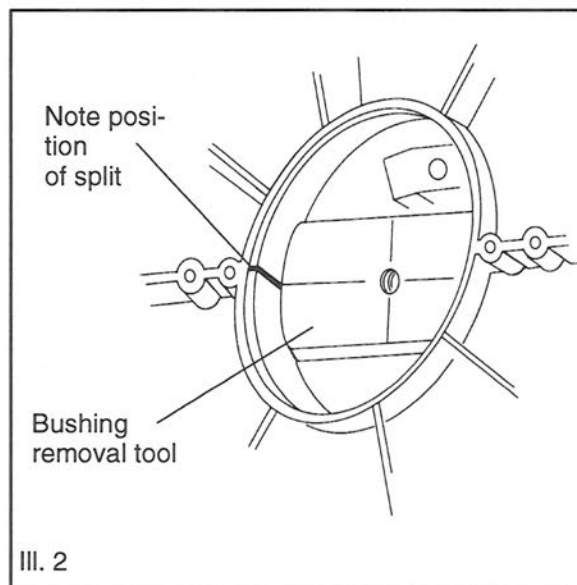
P-85 Driven Clutch Movable Sheave Large Bushing Removal

NOTE: The P-85 driven moveable has a split bushing. Note the position of this split during bushing removal. See III. 2.

Moveable Sheave Bushing Inspection:

Replace the cover bushing if more brass than Teflon™ is visible on the bushing.

1. Inspect bushing and replace if excessively worn.
2. Insert bushing removal tool (Item 6) into sheave, centering split on tool. **NOTE:** The split must be touching the tool. See III. 2.
3. Install main adaptor as illustrated. Install bridge (Item 7) onto puller with legs pointing toward clutch. See III. 3.
4. From the outside, insert thumb through center of sheave. Using downward pressure, hold bushing removal tool tightly in place.
5. With back side toward vise, slide sheave onto puller.
6. Install nut onto puller rod and hand tighten. Slowly align clutch with bridge and turn puller barrel to increase tension if needed.
7. Turn sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut from puller and set aside.
9. Remove tool and bushing from puller. Discard bushing.
10. Remove bridge and adaptor from puller.



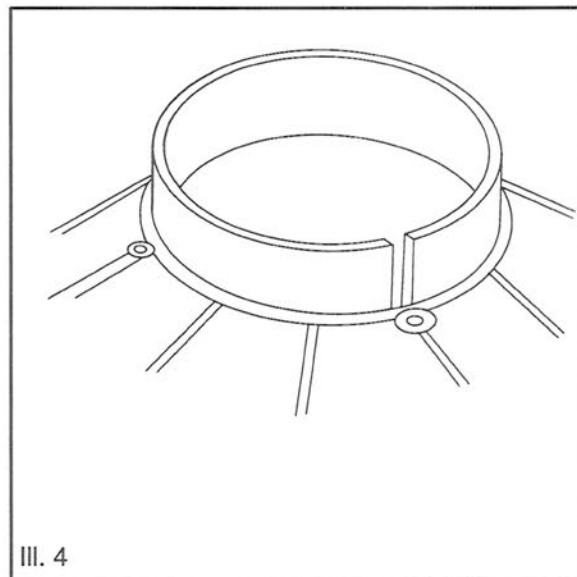
CLUTCHES

Clutch Bushings P-85

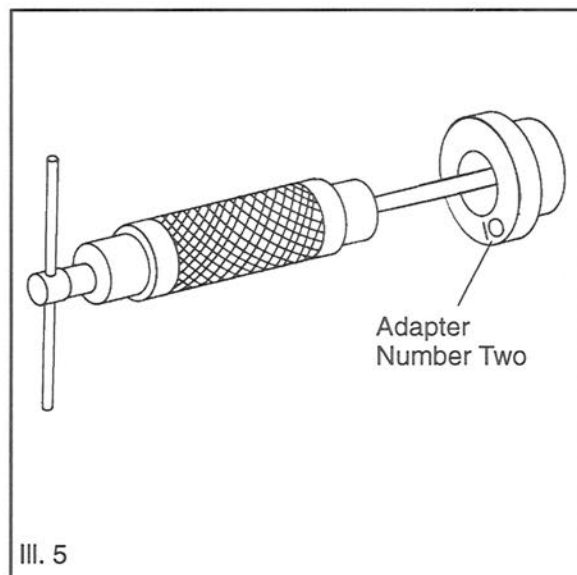
P-85 Driven Clutch Movable Sheave Large Bushing Installation

NOTE: The P-85 driven moveable has a split bushing. The bushing is held in place after installation by screws.

11. Insert bushing (PN 3569803) into clutch and tap lightly with a soft face hammer.



12. Install adapter number two (Item 10) onto puller. See III. 5.
13. Slide clutch sheave onto puller with back side away from vise.
14. Turn puller barrel until rod extends past back side of sheave.
15. Insert large installation tool for DU bushing (Item 4) onto rod.
16. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
17. Turn clutch sheave counterclockwise until bushing is seated.
18. Remove nut from puller rod and set aside.
19. Remove installation tool and slide clutch sheave from puller.



NOTE: The screws hold the bushing in place.

Polaris Kit PN 2871226

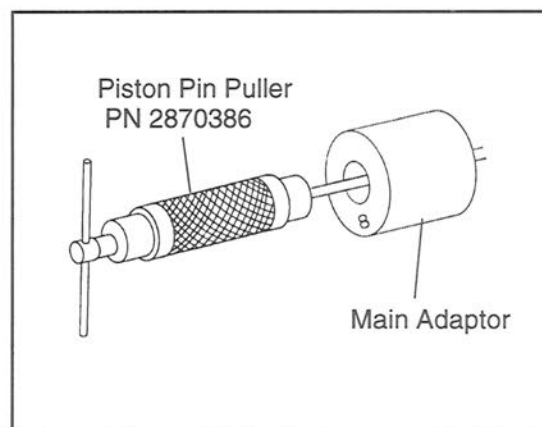
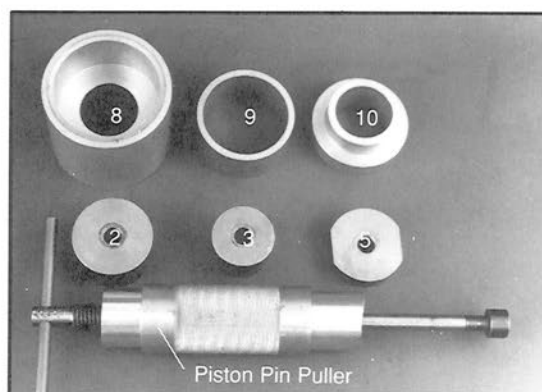
<u>Item</u>	<u>Qty.</u>	<u>Part Description</u>	<u>Part No.</u>
2	1	P-90 Drive Clutch and Driven Clutch Bushing Installation Tool	5020628
3	1	Drive Clutch Cover Bushing Removal and Installation Tool (for all drive clutches)	5020629
5	1	P-90 Driven Clutch Bushing Removal Tool	5020631
8	1	Main Puller Adapter	5020632
9	1	Adapter Reducer	5010279
10	1	Number Two Puller Adapter	5020633

P-90 Drive Clutch Moveable Sheave - Bushing Removal

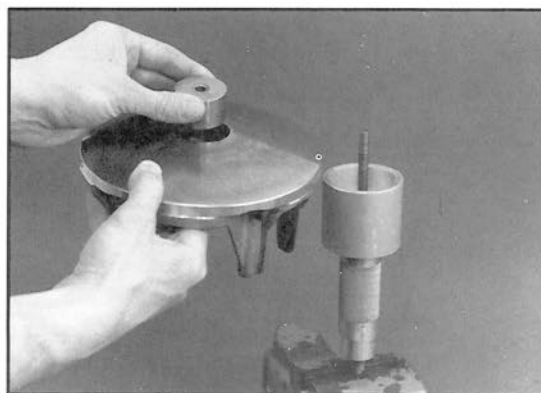
Moveable Sheave Bushing Inspection:

Replace the cover bushing if more brass than Teflon™ is visible on the bushing.

1. Install handle end of piston pin puller securely into bench vise and lightly grease puller threads.
2. Remove nut from puller rod and set aside.
3. Install main adapter (Item 8) onto puller.



4. Insert adaptor #2 into bushing from belt side as shown. With towers pointing toward vise, slide sheave and bushing onto puller rod.
5. Install nut removed in step 2 onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Nut is left hand thread.



CLUTCHES

Clutch Bushing P-90

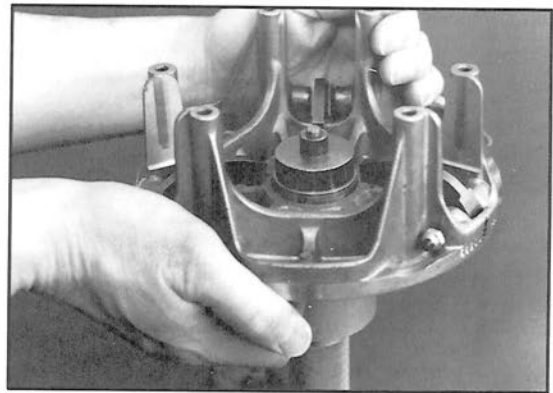
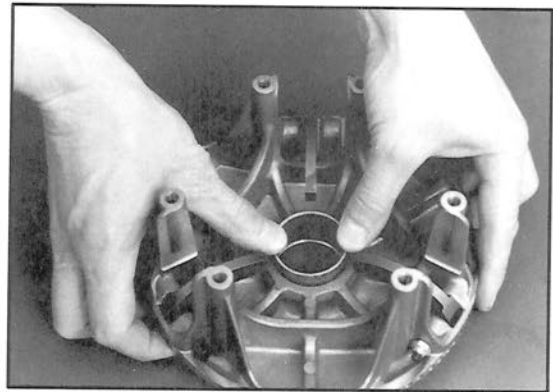
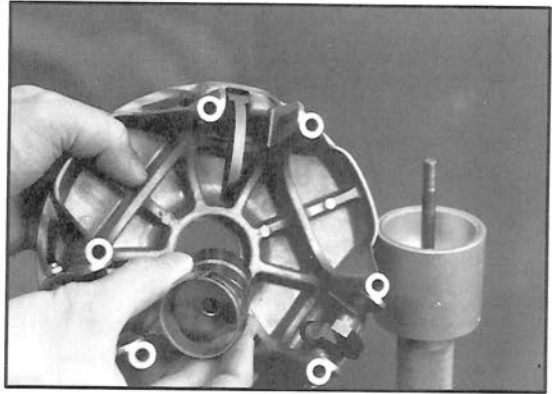
6. Turn sheave and puller barrel together counterclockwise on puller rod until bushing is removed.
7. Remove nut from puller rod and set aside.
8. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

Drive Clutch Moveable Sheave - Bushing Installation

9. Place main adapter (Item 8) on puller.
10. Push bushing into center of sheave on tower side by hand.

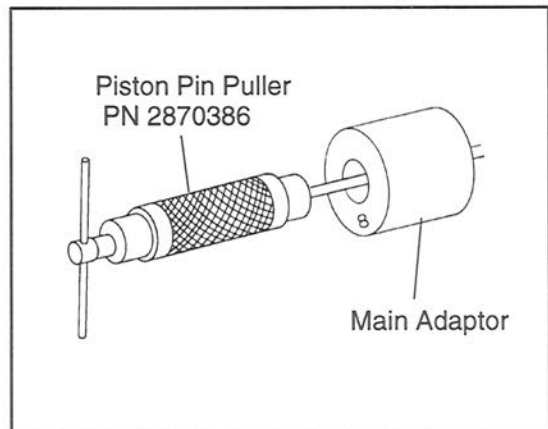
Bushing PN 3576504

11. Insert installation tool (Item 2) into center of sheave and with towers pointing away from vise, slide sheave onto puller rod.
12. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
13. Turn sheave and barrel together counterclockwise until bushing is seated.
14. Remove nut from puller rod and set aside.
15. Remove sheave from puller.
16. Remove installation tool.



P-90 Drive Clutch Cover - Bushing Removal

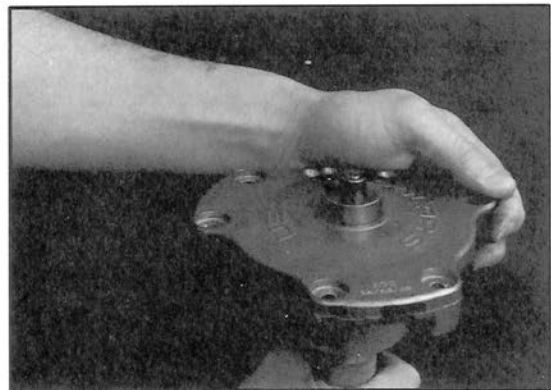
1. Install main adapter (Item 8) on puller.



2. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
3. With inside of cover toward vise, slide cover onto puller.
4. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.



5. Turn clutch cover counterclockwise on puller rod until bushing is removed.
6. Remove nut from puller rod and set aside.
7. Remove bushing and bushing removal tool from puller. Discard bushing.



CLUTCHES

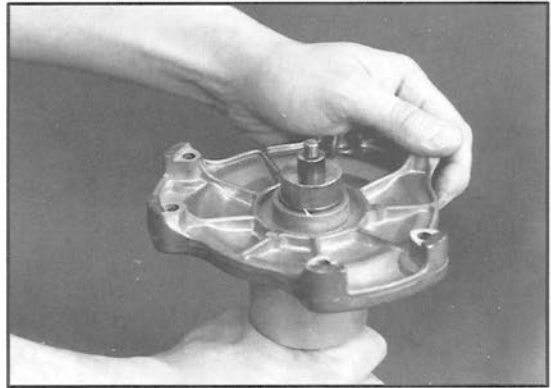
Clutch Bushing P-90

P-90 Drive Clutch Cover - Bushing Installation

8. On Garmax™ style bushings (PN 3576516) apply Loctite 680 retaining compound (PN 2870584) to the outer surface of the bushing. Retaining compound is not required on bronze / Teflon™ type bushings (PN 3576510). **Do not lubricate bushings, or premature wear will result.** Working from inside of cover, insert bushing and bushing installation tool into center of clutch cover.



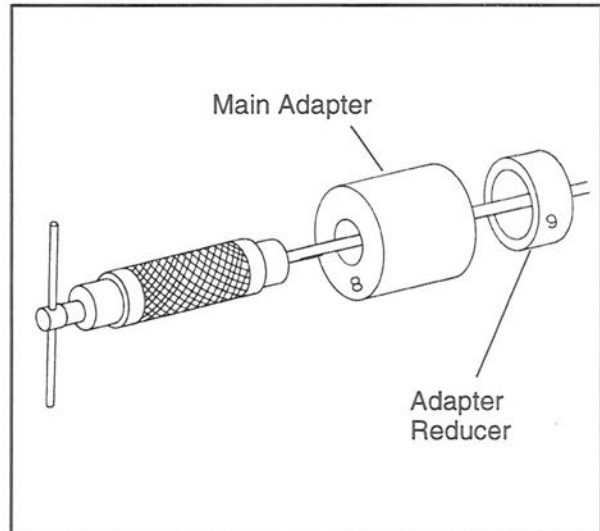
9. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
10. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
11. Turn clutch cover and barrel together counterclockwise on puller rod until bushing is seated.
12. Remove nut from puller rod and take installation tool and clutch cover off rod.



P-90 Driven Clutch Moveable Sheave - Bushing Removal

NOTE: Bushings are installed at the factory using Loc-tite™ 680. In order to remove the bushing it will be necessary to apply heat.

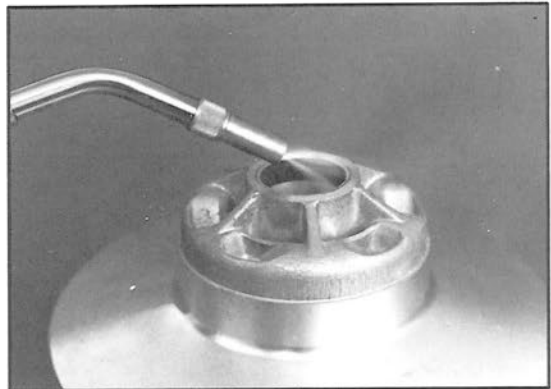
13. Install main adapter (Item 8) onto puller.
14. Insert adapter reducer (Item 9) onto puller, sliding it inside the main adapter.
15. Remove ramp buttons from moveable sheave.



16. Using a hand held propane torch, apply heat directly on bushing until tiny smoke tailings appear.

CAUTION:

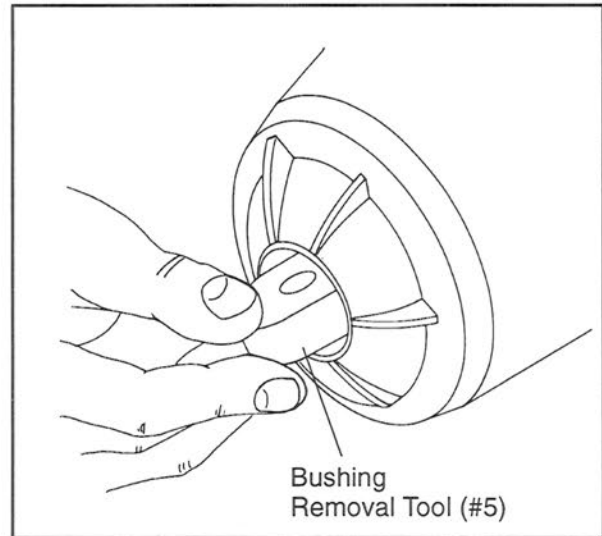
Clutch components will be hot! In order to avoid serious burns, wear some type of insulated gloves for the rest of the removal process.



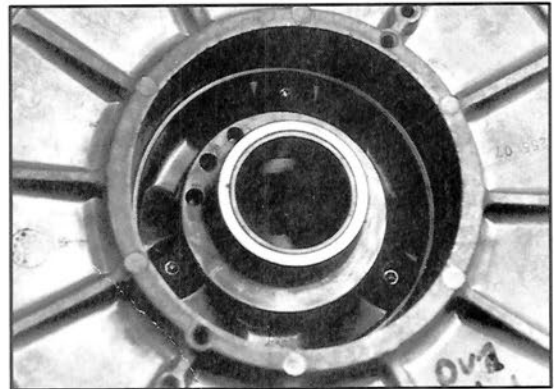
CLUTCHES

Clutch Bushing P-90

17. Working from the top, install bushing removal tool (Item 5) into center of clutch sheave with smaller diameter toward bushing to be removed. See illustration at right.



18. Install sheave onto puller.
19. Install nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.

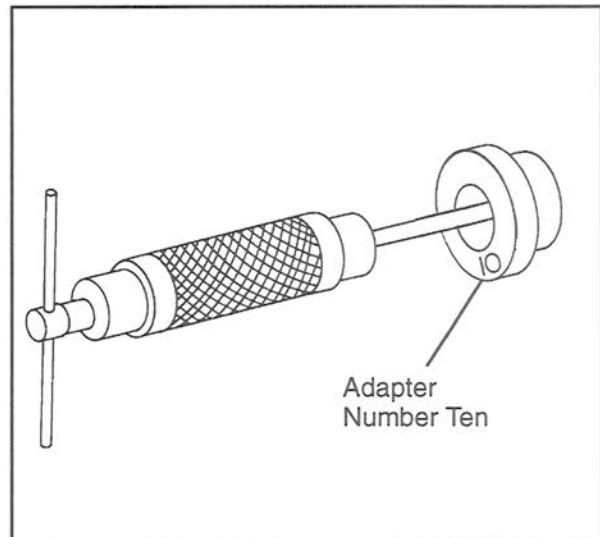


20. Turn clutch sheave counterclockwise until bushing is removed. Repeat steps 17. - 20. for other bushing.
21. Remove nut from puller rod and set aside.
22. Remove adapters from puller.
23. Remove bushing and removal tool from adapters. Discard bushing.



P-90 Driven Clutch Moveable Sheave - Bushing Installation

24. Working from the top, insert adapter number ten onto puller. See illustration at right.



25. Start new bushing evenly in moveable sheave.



26. Install sheave onto puller with new bushing upward as shown. Install adaptor number two.



CLUTCHES

Clutch Bushing P-90

27. Install nut onto puller rod and hand tighten against installation tool.

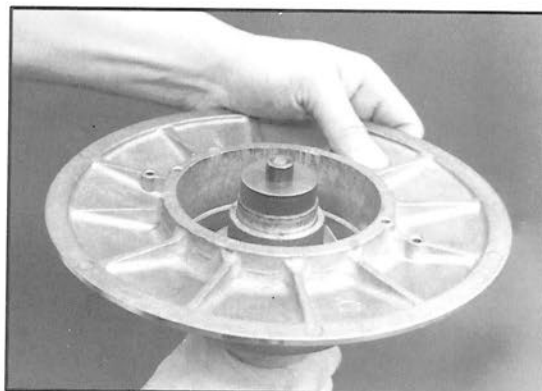


28. Turn clutch sheave counterclockwise until bushing is seated.

29. Remove nut from puller rod and set aside.

30. Remove installation tool and clutch sheave from puller.

31. Repeat installation procedure for other moveable bushing.



CLUTCHES Troubleshooting

SYMPTOMS	PROBABLE CAUSE	REMEDY
Harsh drive clutch engagement	-Drive belt worn too narrow -Excessive belt to sheave clearance with new belt (high performance version without detent shift weight)	-Replace -Perform belt to sheave clearance adjustment with shim washers beneath spider
Drive belt turn over	-Wrong belt for application -Clutch alignment out of spec -Engine mount broken or loose -Driven clutch sheaves have excessive runout, are bent or damaged	-Replace -Adjust alignment offset -Inspect, adjust or replace -Measurement should be taken .25" in from outer circumference on sheave face. Maximum allowable tolerance is .015" (.6 mm).
Noise in drive system	-Broken drive clutch components -Excessive drive clutch button - tower clearance -Bearing failure/ chaincase, jackshaft or front drive shaft -Drive chain loose or worn, sprocket teeth broken -Driven clutch bushing worn excessively or spring broken -Drive chain adjustment too tight/too loose -Drive belt surface flat spots	-Inspect/replace -Install new buttons or shim out existing buttons -Inspect/replace -Inspect/adjust or replace -Inspect/replace -Inspect/replace - Inspect/adjust - Inspect/replace
Over rev during initial acceleration or during heavy pulling at low ground speeds.	-Spider roller position remaining in detent	-Add spider shim washers -Add driven washers
Engine bogs after engagement.	-Improper driven clutch setup -Worn belt -Excessive belt deflection -Improper offset/alignment -Broken or misadjusted torque stop -Broken motor mount -Jackshaft bearing seizure	-Reduce gear ratio (chaincase models) -Replace -Subtract driven clutch washers -Inspect/adjust -Inspect/adjust/replace -Inspect/replace -Replace

CLUTCHES

Clutch System Troubleshooting

SYMPTOMS	PROBABLE CAUSE	REMEDY
Engine RPM below specified operating range, although engine is properly tuned	a) Wrong or broken drive clutch spring b) Drive clutch shift weight too heavy c) Driven clutch spring broken or installed in wrong helix location d) Drive belt too long e) Improper driven clutch setup	a) Replace with recommended spring b) Install correct shift weight kit to match engine application c) Replace spring; refer to proper installation location d) Install new belt and/or adjust belt tension e) Install correct parts and/or adjust to match engine application and machine use
Erratic engine operating RPM during acceleration or load variations	Drive clutch binding or driven clutch malfunction Converter sheaves greasy; belt slippage	-Disassemble drive clutch; inspect shift weights for wear and free operation Clean clutches; install new belt -Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area -Replace ramp buttons -Inspect moveable sheave for excessive bushing clearance/replace
Engine RPM above specified operating range	a) Incorrect drive clutch spring (too high spring rate) b) Drive clutch shift weights incorrect for application (too light) c) Drive clutch binding d) Driven clutch binding e) Converter sheaves greasy; belt slippage f) Improper driven clutch setup	a) Install proper spring b) Install proper shift weights c) Disassemble and clean clutch, inspecting shift weights and buttons. Reassemble without the spring to determine probable cause. d) Disassemble, clean and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location e) Clean clutches; install new belt f) Install correct parts and/or adjust to match engine application and machine use
Burnt Belts / Premature Wear Also see Belt Wear / Burning Diagnosis Chart on page 6.63	a) Wrong or broken drive clutch spring b) Drive clutch shift weight too heavy c) Driven clutch spring broken or installed in wrong helix location d) Drive belt too long e) Converter sheaves greasy; belt slippage. f) Improper driven clutch setup	a) Replace with recommended spring b) Install correct shift weight kit to match engine application c) Replace spring; refer to proper installation location d) Install new belt and/or adjust belt tension e) Clean clutches; install new belt f) Install correct parts and/or adjust to match engine application and machine use

CLUTCHES

Belt Wear / Burn Diagnosis

Belt Wear / Burn Diagnosis	
Possible Cause Of Wear Or Burning	Solution
Driving at or about engagement RPM for extended periods in all types of conditions	Drive at higher RPM if possible. Gear the machine down. Make sure belt deflection is at 1.25" to achieve optimum starting ratio
Cold weather startups	Be patient. Warm up engine at least 5 minutes or until it readily responds to throttle input. For the quickest most efficient driveaway in extreme cold weather, take drive belt off machine and bring it in to a warm environment. Break skis and track loose from the snow. Engage throttle aggressively for short durations for initial cold driveaway
Towing another machine at or about engagement RPM	When possible, do not go in deep snow when towing another machine. Use fast, effective throttle to engage the clutch. Not all machines are intended for pulling heavy loads or other machines.
Spinning track while vehicle is stuck (high RPM, low vehicle speed, high ambient temp. Example: 8000 RPM, 10mph vehicle speed, 60 mph indicated on speedometer.	Lower the gear ratio. Remove windage plates from driven clutch. If possible, move to better snow conditions and reduce RPM. Avoid riding in very high ambient temperatures.
Ice and snow piled up between track and tunnel overnight or after stopping for a long period of time (enough to re-freeze the snow).	Break loose snow and ice under tunnel. Allow longer than normal warmup. Allow belt to warm sufficiently and increase grip ability on clutch sheaves. Use fast, effective throttle when engaging clutch.
Poor running engine (Bog, Miss, Backfire, etc.)	Maintain good state of tune including throttle and choke synchronization. Check for fouled spark plug(s). Check for foreign material in carbs. Make sure no water or ice in fuel tank, lines, or carburetors.
Loading machine on trailer	Use caution when loading machine. Carbide skags may gouge into trailer and prevent drive train from spinning freely. Use enough speed to drive completely onto trailer. If machine cannot be driven completely onto trailer, it may need to be pulled or pushed to avoid belt wear / burning.
Clutch malfunction	Check for correct clutch components.
Slow, easy belt engagement – easing on the throttle	Use fast, effective throttle to engage the clutch.

