



SPECIAL SERVICE TOOLS AND SUPPLIES

PART NUMBER	TOOL DESCRIPTION
2870506	Clutch Puller
9314177	Clutch Holding Wrench
2871358	Clutch Holding Fixture
2870341	Drive Clutch Spider Removal and Install Tool
2870654	Clutch Offset Alignment Tool
2870913	Driven Clutch Puller
2870910	Roller Pin Tool
2871226	Clutch Bushing Replacement Tool Kit
2870386	Piston Pin Puller
2872292	EBS Clutch Alignment Tool
2201379	EBS Bushing Replacement Kit
8700220	Clutch Compression Tool
2871025	Clutch Bushing Replacement Tool Kit

SPECIAL SUPPLIES

PART NUMBER

Loctite [®] 680	2870584
RTV Silicone Sealer	2870661
Loctite Gasket Remover	2870601

PVT SYSTEM FASTENER TORQUES

Drive Clutch Retaining Bolt	40 ft. lbs. (54 Nm)
Driven Clutch Retaining Bolt	17 ft. lbs. (23 Nm)
PVT Inner Cover Bolts	12 ft. lbs. (16 Nm)
Drive Clutch Spider (Standard Clutch)	200 ft. lbs. (271 Nm)
Drive Clutch Spider (EBS Clutch)	185 ft. lbs. (251 Nm)
Drive Clutch Spider Lock Nut (Plastic)	5 ft. lbs. (6.5 Nm)
Drive Clutch Cover Plate	90 in. lbs. (10 Nm)


Refer to General Chapter 1 for Specifications by model.



PVT OPERATION

The Polaris variable transmission (PVT) consists of three major assemblies: 1) drive clutch; 2) drive belt; and 3) driven clutch. The internal components of the drive clutch and driven clutch control clutch engagement (for initial vehicle movement), clutch upshifting and backshifting. During the development of an ATV, the PVT system is matched first of all to the engine power curve; then to average riding conditions and to vehicle design usage. Modifications to the PVT or variations of components at random are never recommended. Proper PVT system setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

WARNING

 All PVT system 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 PVT system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.**

DRIVE CLUTCH OPERATION

The drive clutch primarily senses engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. When the engine RPM is increased, the centrifugal force of the shift weights working against the coil spring increases. When this force reaches a force higher than the preload in the spring, the moveable sheave of the drive clutch will move inward, contacting the drive belt. The force will pinch the belt between the spinning sheaves and cause the drive belt to move. This movement in turn rotates the driven clutch.

At light throttle settings the drive belt will stay low in the drive clutch and high in the driven clutch. As engine RPM increases, so does the centrifugal force on the shift weights, causing the drive belt to be forced upward in the drive clutch and downward into the driven clutch. The forces in the driven clutch will now affect the upshift.

DRIVEN CLUTCH OPERATION

The driven clutch primarily senses torque. It opens and closes according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance on the input shaft is greater than the load from the drive belt, it will keep the drive belt outward at the top of the driven clutch sheaves. As the throttle setting and engine horsepower increase, there will be a greater load on the drive belt, pulling the belt down into the driven clutch and up on the drive clutch. This action, which increases the driven clutch speed, is called upshifting.

If the throttle setting remains the same and the vehicle is subjected to a heavier load, the driven clutch senses this load, moving the belt back up on the sheaves of the driven clutch and down into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called downshifting.

In situations where loads vary (such as uphill and downhill) and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system will hold the engine RPMs at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect the PVT system is similar to a power governor. Rather than change throttle position, as a governor does, the PVT system changes engine load requirements by either upshifting or downshifting.





PVT MAINTENANCE/INSPECTION

Under normal operation the PVT system will provide years of trouble free operation. Periodic inspection and maintenance is required to keep the system operating at peak performance. The following list of items should be inspected and maintained to ensure maximum performance and service life of PVT components. Refer to the troubleshooting checklist at the end of this chapter for more information.

1. **Belt Tension, Drive to Driven Clutch Offset, Belt Width.** See Pages 6.17-6.21.
2. **Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs.** See Pages 6.10-6.12.
3. **Sheave Faces.** Clean and inspect for wear.
4. **PVT System Sealing.** Refer to appropriate illustration below and on the following pages. The PVT system is air cooled by fins on the drive clutch stationary sheave. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented cover. All connecting air ducts (as well as the inner and outer covers) must be properly sealed to ensure clean air is being used for cooling the PVT system and also to prevent water and other contaminants from entering the PVT area. This is especially critical on units subjected to frequent water forging.

PVT DRYING

If water is ingested, shift transmission to neutral and rev engine slightly to expel the moisture and air-dry the belt and clutches. Allow engine RPM to settle to idle speed, shift transmission to lowest available range and test for belt slippage. Operate ATV in lowest available range for a short period of time until PVT system is dry.



PVT OVERHEATING

During routine maintenance or whenever PVT system overheating is evident, it's important to check the inlet and outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The ATV should be operated in LOW RANGE when pulling or plowing heavy loads, or if extended low speed operation is anticipated.

Clutch Drive Belt & Cover Related Issues: Diagnosis	
Possible Causes	Solutions/What to do
Loading the ATV into a pickup or tall trailer when in high range.	Shift transmission to low range during loading of the ATV to prevent belt burning.
Starting out going up a steep incline.	When starting out on an incline, use low range, or dismount the ATV after first applying the park brake and perform the "K" turn.
Insufficient warm-up of ATVs exposed to low ambient temperatures.	Drive at higher speed or use Low Range. The use of Low Range is highly recommended for cooler PVT operating temperatures and longer component life.
Driving at low RPM or low ground speed (at approximately 3-7 MPH).	Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.
Slow and easy clutch engagement.	Fast, effective use of the throttle for efficient engagement.
Towing/Pushing at low RPM/low ground speed.	Use Low Range only.
Plowing snow, dirt, etc./utility use.	Use Low Range only.
Stuck in mud or snow.	Shift the transmission to Low Range, carefully use fast, aggressive throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Climbing over large objects from a stopped position.	Shift the transmission to Low Range, carefully use fast, aggressive, brief throttle application to engage clutch. WARNING: Excessive throttle may cause loss of control and vehicle overturn.
Belt slippage from water or snow ingestion into the PVT system.	Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to full throttle . Repeat several times as required. During this procedure, the throttle should not be held at the full position for more than 10 seconds. Clutch seals should be inspected for damage if repeated leaking occurs.
Clutch malfunction.	For inspection of clutch components, please contact your Polaris dealer.
Poor engine performance.	Fouled plugs, foreign material in gas tank, fuel lines, or carburetor. Contact you dealer for further service information.
GENERAL RANGE OPERATION GUIDELINES:	Low Range: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, etc.), low ground speeds.
	High Range: High ground speeds, speeds above 7 MPH.



PVT DISASSEMBLY

NOTE: Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement. (See Page 6.8).

1. Remove seat.
2. Remove or loosen rear cab fasteners as necessary to gain access to PVT outer cover.
3. Remove PVT air outlet duct hose.
4. Remove outer cover screws. Refer to Page 6.8.
5. Mark the drive belt direction of rotation and remove drive belt. See Page 6.18 for drive belt removal.
6. Remove drive clutch retaining bolt and remove drive clutch using puller.

Drive Clutch Puller (PN 2870506)

Drive Clutch Holder (PN 9314177)





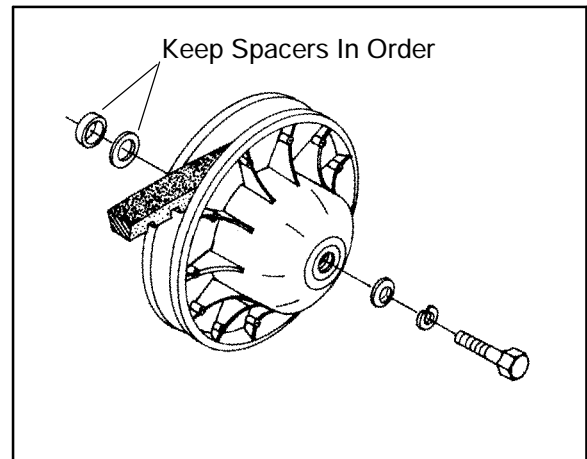
PVT DISASSEMBLY, CONT.

7. Remove driven clutch retaining bolt and driven clutch. Use puller if necessary.

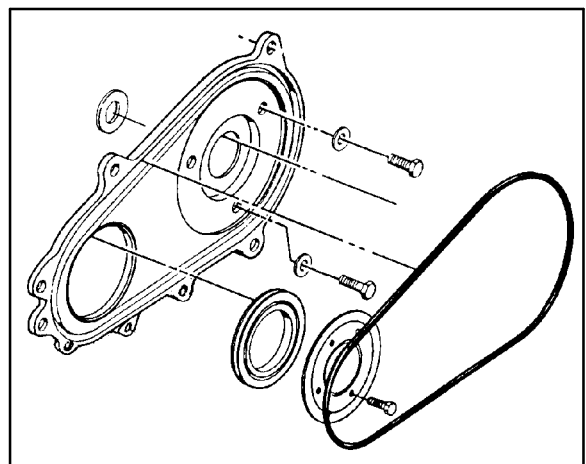
Driven Clutch Puller (PN 2870913)



8. Remove driven clutch offset spacers from the transmission input shaft.



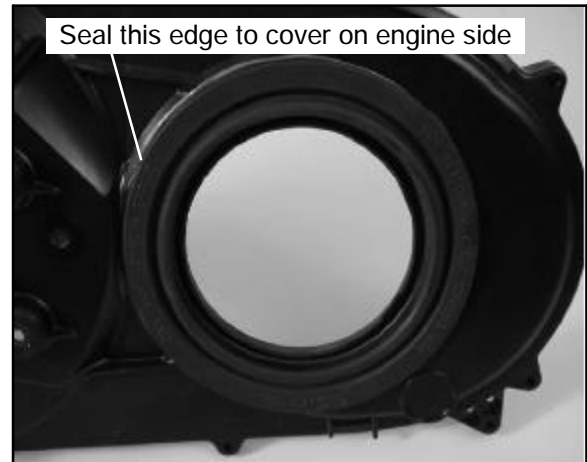
9. Remove screws and retainer plate.
10. Remove inner cover retaining bolts at rear of cover.
11. Remove cover along with foam seal on back of cover or shaft.





PVT ASSEMBLY

1. Inspect PVT inner cover-to-engine seal. Replace if cracked or damaged.
2. Place a new seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner cover-to-engine seal, to ensure a water tight fit between the seal and the cover on engine side. Surfaces must be clean to ensure adhesion of silicone sealant.
4. Reinstall cover and tighten rear cover bolts just enough to hold it in place.
5. Fit lip of inner cover seal (A) to engine. Install seal retainer plate and tighten screws securely.

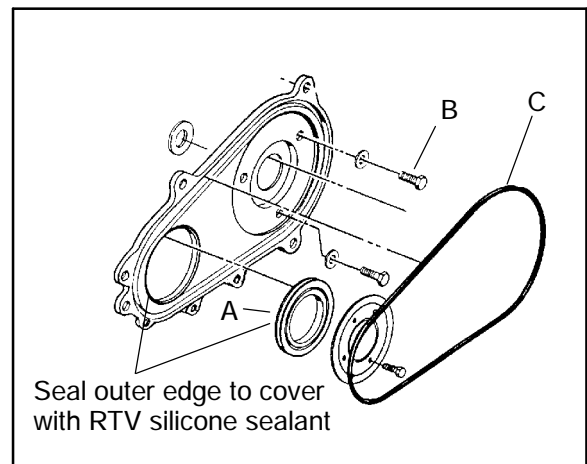


6. Torque rear inner cover bolts (B) to specification.

Inner Cover Bolt Torque (Rear):
12 ft. lbs. (16.6 Nm)

Driven Clutch Retaining Bolt Torque:
17 ft. lbs. (23.5 Nm)

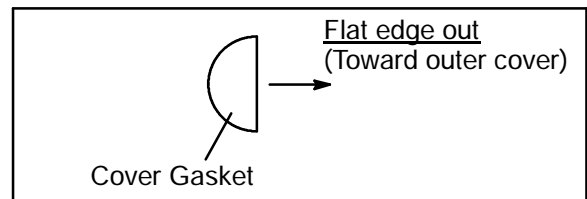
Drive Clutch Retaining Bolt Torque:
40 ft. lbs. (55 Nm)



7. Install clutch offset spacer on transmission input shaft.
8. Clean splines inside driven clutch and on the transmission input shaft.
9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.
11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.
13. Reinstall drive belt noting direction of rotation. If a new belt is installed, install so numbers can be easily read.

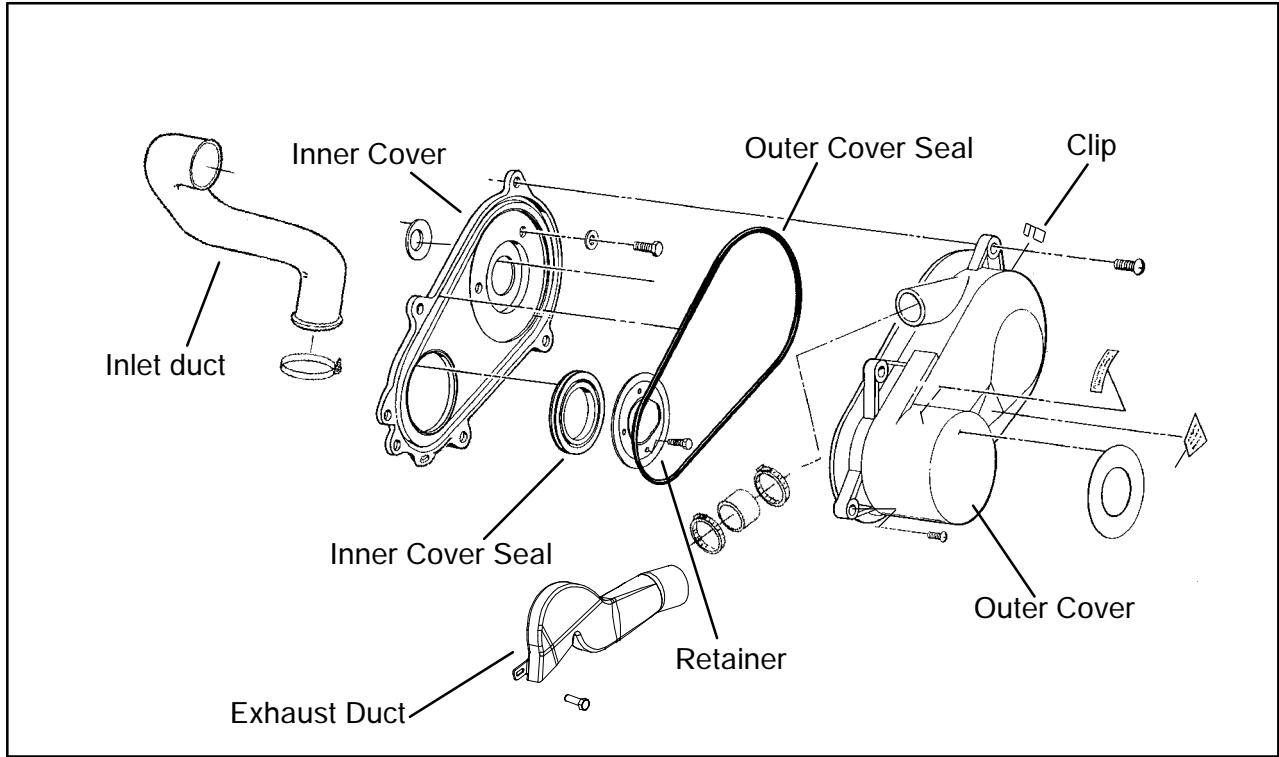


14. Replace PVT outer cover rubber gasket with the flat side out (C).
15. Reinstall PVT outer cover and secure with screws.
16. Reinstall rear cab assembly and seat.





PVT SEALING AND DUCTING COMPONENTS





DRIVE CLUTCH SPRING SPECIFICATIONS

The drive clutch spring has two primary functions:

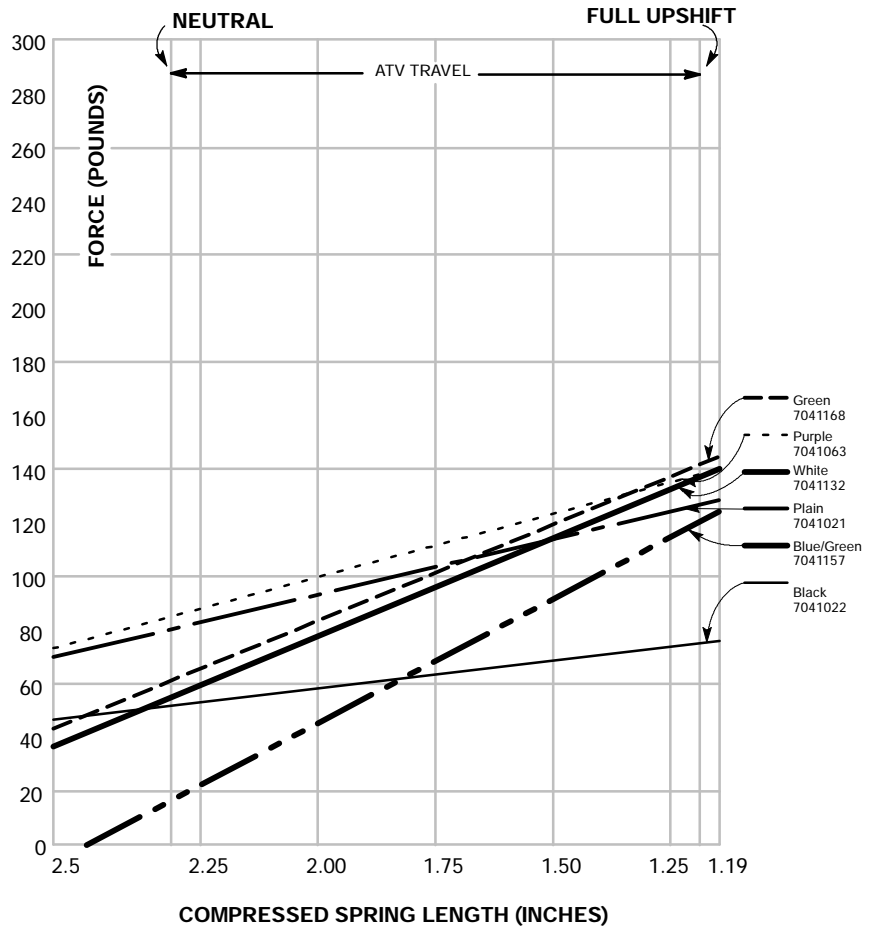
1. **To control clutch engagement RPM.** The springs which have a higher rate when the clutch is in neutral will increase clutch engagement RPM.
2. **To control the rate at which the drive belt moves upward in the drive clutch sheaves.** This is referred to as drive clutch upshift.

There are other components which control upshift, but the spring is one of the primary components in insuring optimum performance. It is very important that the spring is of the correct design and is in good condition.

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.

The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe stress the spring is subject to during operation, it should always be inspected for tolerance limits during any clutch operation diagnosis or repair.

With the spring resting on a flat surface, measure its free length from the outer coil surfaces as shown. Refer to the spring specification chart for specific free length measurements and tolerances. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.



Primary Clutch Springs

PART NUMBER	COLOR CODE	WIRE DIAMETER	FREE LENGTH ± .125I
7041021	Plain	.157I	4.38I
7041022	Black	.140I	4.25I
7041063	Purple	.168I	4.37I
7041132	White	.177I	2.92I
7041168	Green	.177I	3.05I
7041157	Blue/Green	.177I	2.53I

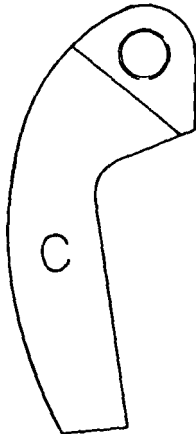
Secondary Clutch Springs

PART NUMBER	DESCRIPTION
7041198	Red
7041782	Black 5-coil
7041501	Gold 6-coil
7041499	Silver
7041296	Blue
7041646	Silver/Blue

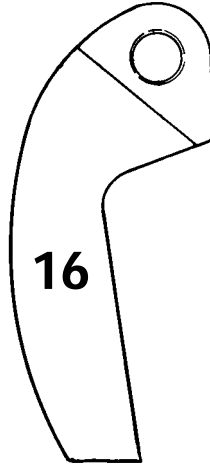


SHIFT WEIGHTS

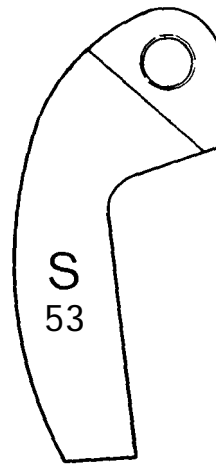
Shown below are the shift weights which have been designed for, or which may be used in the PVT system. These shift weights have many factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding of their positioning and the effects they may have on belt to sheave clearance, clutch balance and shifting pattern.



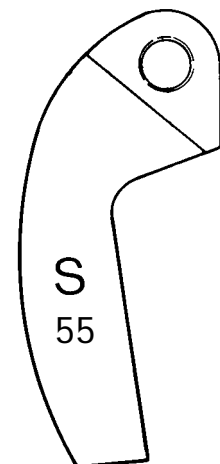
PN 5630418
50 gr



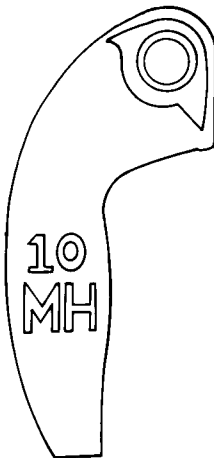
PN 5630279
43 gr



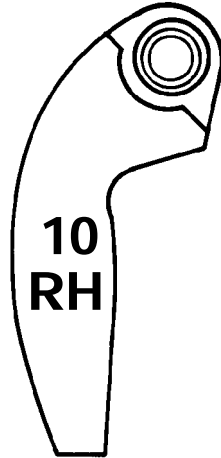
PN 5630095
53 gr



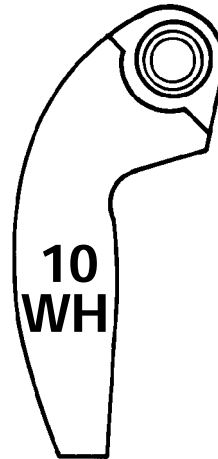
PN 5630509
55 gr



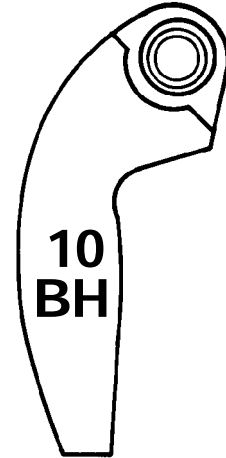
PN 5630513
50.5 gr



PN 5630709
44 gr



PN 5630710
46 gr

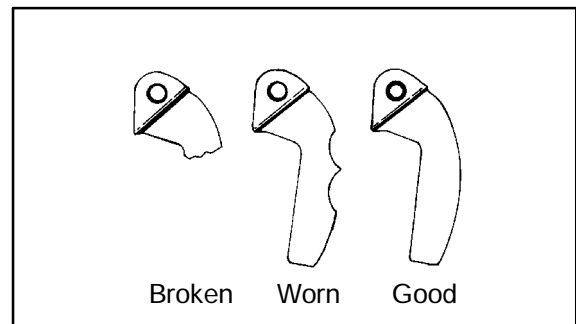


PN 5630711
47gr



SHIFT WEIGHT INSPECTION

1. Remove shift weight bolts and weights. Inspect as shown. The contact surface of the weight should be smooth and free of dents or gall marks. Inspect the weight pivot bore and pivot bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts. **NOTE:** A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See roller inspection, Page 6.15.



BUTTON TO TOWER CLEARANCE INSPECTION

1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See spider removal Page 6.14.

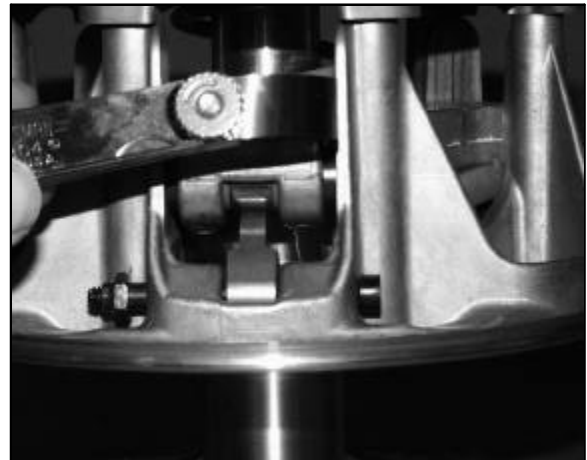
Button to Tower Clearance:
.000 - .0011

2. Inspect sheave surfaces. Replace the *entire service clutch* if worn, damaged or cracked.

▲ WARNING

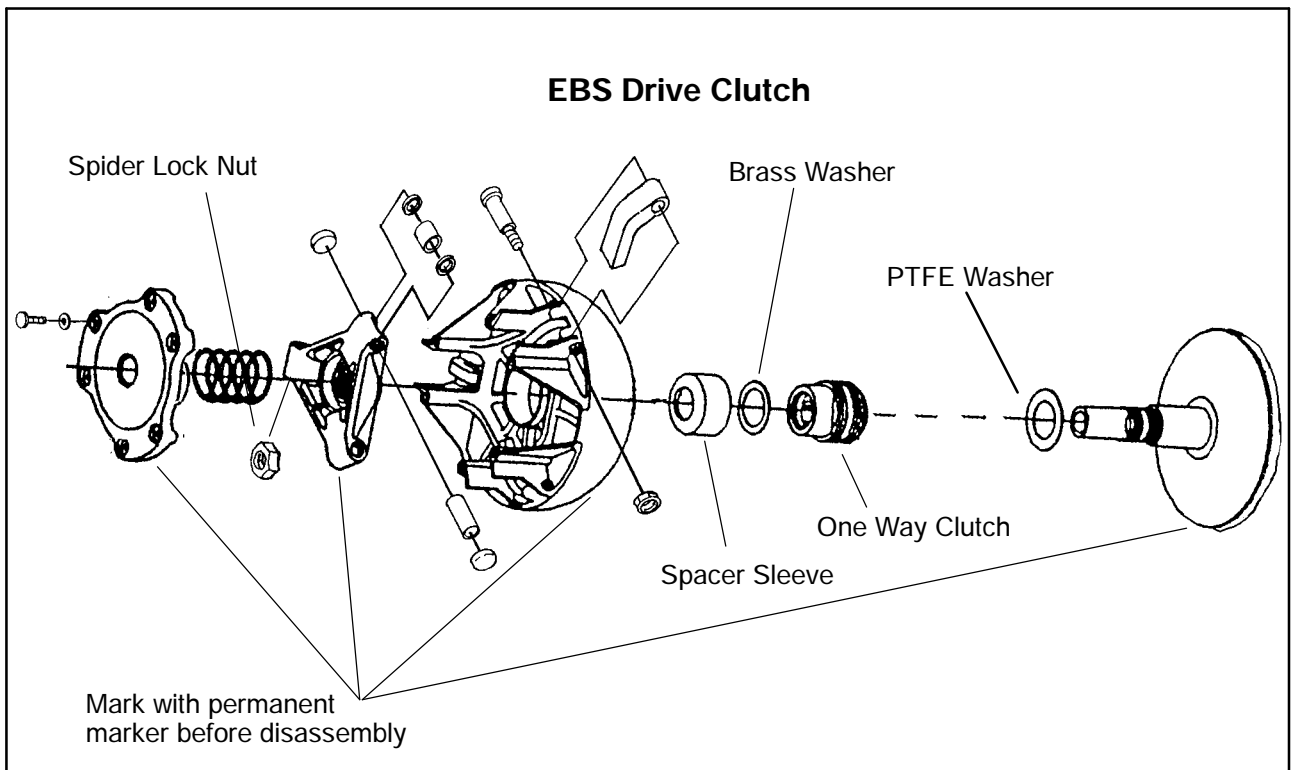
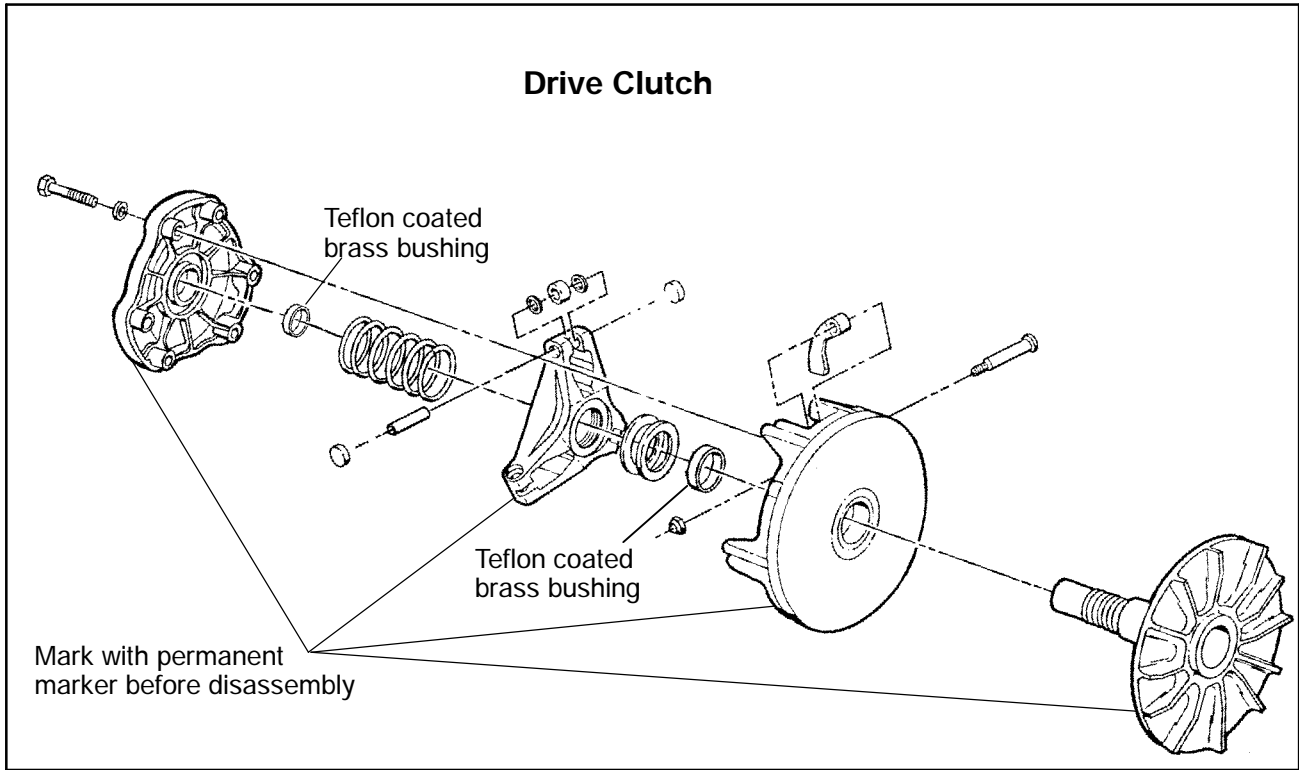
The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

All PVT system 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 PVT system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.**





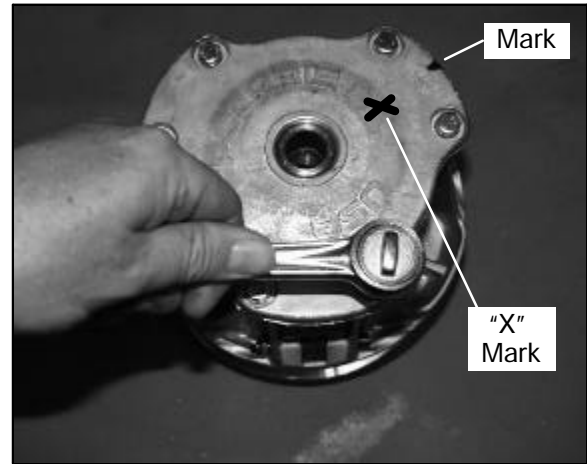
DRIVE CLUTCH EXPLODED VIEW





DRIVE CLUTCH DISASSEMBLY

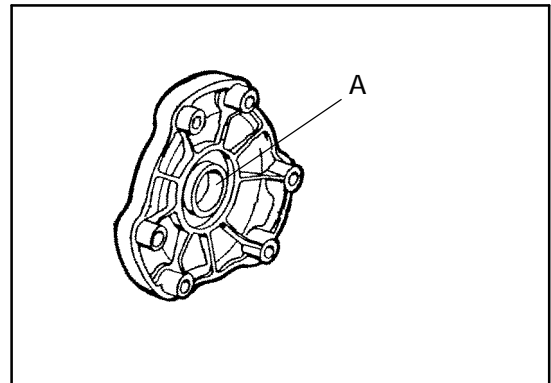
1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference. The X's may not have been in alignment before disassembly.
2. Remove cover bolts evenly in a cross pattern, and remove cover plate.



3. Inspect cover bushing (A). The outer cover bushing is manufactured with a Teflon[®] coating. Bushing wear is determined by the amount of Teflon[™] remaining on the bushing.

Cover Bushing Inspection:

Replace the cover bushing if more brass than Teflon[®] is visible on the bushing. Refer to bushing replacement in this chapter.



4. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.
5. Remove and inspect spring. (See Page 6.9)





SPIDER REMOVAL

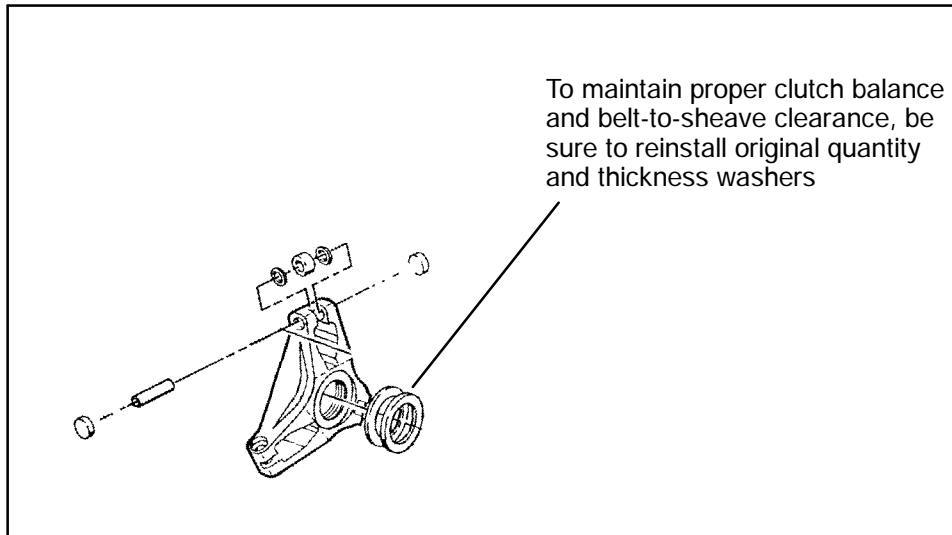
1. Install clutch in holding fixture and loosen the spider (counterclockwise) using spider removal tool.

Clutch Holding Fixture:
(PN 2871358)

Drive Clutch Spider Removal Tool:
(PN 2870341)



NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. Be sure to note the number and thickness of these washers.

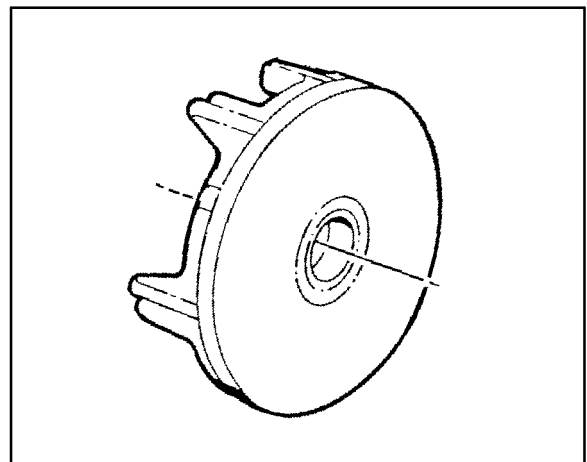


Moveable Sheave Bushing Inspection

2. Inspect the Teflon[®] coating on the moveable sheave bushing.

Moveable Sheave Bushing Inspection:

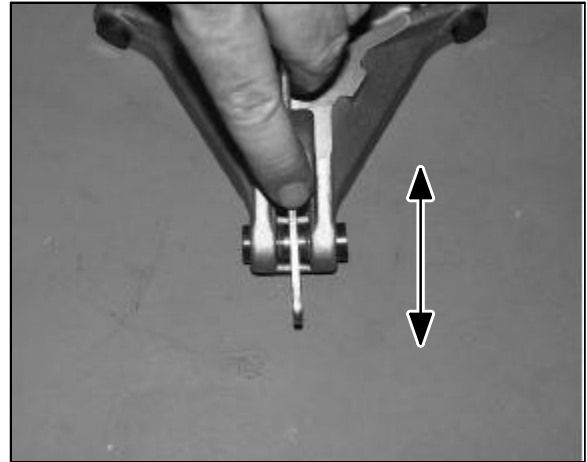
Replace the cover bushing if more brass than Teflon[®] is visible on the bushing. Refer to bushing replacement in this chapter.



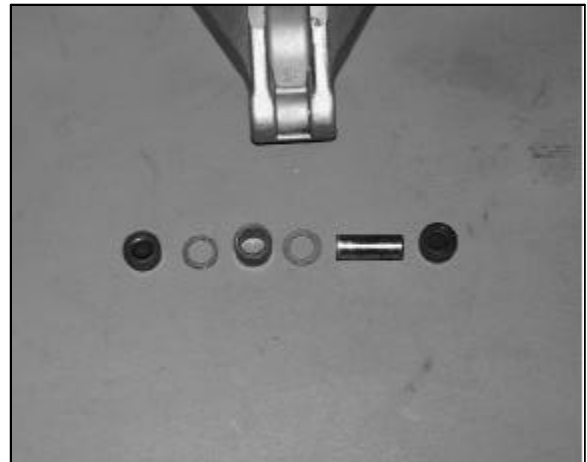


ROLLER, PIN AND THRUST WASHER INSPECTION

3. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace rollers, pins and thrust washers in sets of three. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Use the Roller Pin Tool (PN 2870910) to replace rollers and pins. Take care not to damage roller bushing or bearing surface of the new pin during installation.



4. Rubber backed buttons can and should be used in all ATV clutches *if the hollow roller pin is changed to the solid roller pin*. **NOTE:** The rubber side of the button is positioned toward the solid roller pin. It is recommended to switch all buttons to the rubber version during service.





DRIVE CLUTCH ASSEMBLY

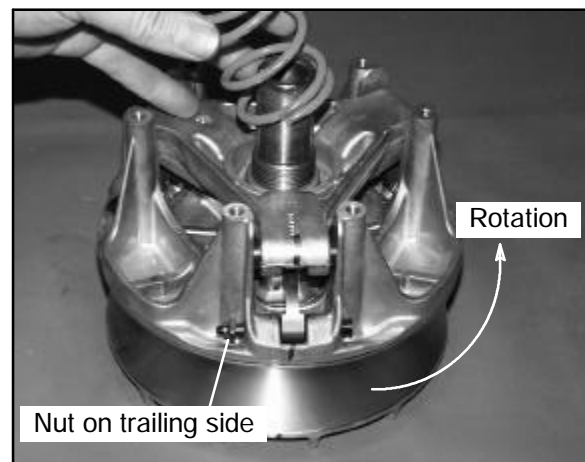
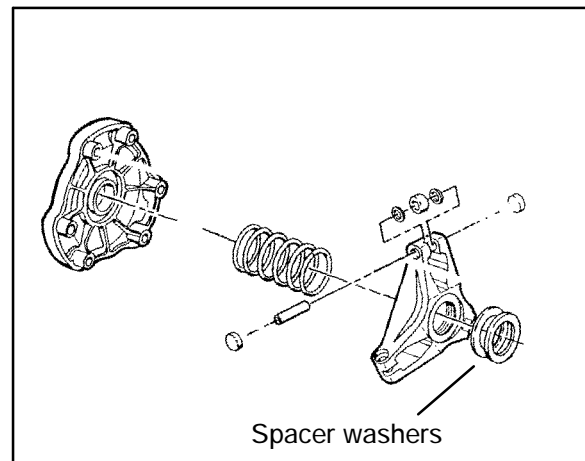
NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. The Teflon[®] bushings are self-lubricating. **Do not apply oil or grease to the bushings.**

1. Reassemble drive clutch in the following sequence. Be sure the "X", or the marks that were made earlier, are aligned during each phase of assembly.
 - a) "X", or the marks that were made earlier, on cover
 - b) spider, making sure spacer washers are installed underneath spider and positioned properly in recess
 - c) "X", or the marks that were made earlier, under weight
2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. Compress spider buttons for each tower and install spider, making sure that "X", or the marks that were made earlier, on spider aligns with "X", or the marks that were made earlier, in moveable sheave.
5. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave. Refer to Page 6.1 for torque specification.

CAUTION:

Be sure the spider spacer washers are fully seated in the recessed area in the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.

6. Install shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.





DRIVE CLUTCH ASSEMBLY, CONT.

- Reinstall cover, aligning "X" mark with other marks.
Torque cover bolts evenly to specification.

Spider Torque:
200 ft. lbs. (276 Nm)

Cover Screw Torque:
90 in. lbs. (10.4 Nm)



DRIVE BELT TENSION

NOTE: Pinch the sheaves lightly together with clamp to prevent the belt from being pushed into the driven sheave.

- Place a straight edge on top of the belt between drive and driven clutch.
- Push down on drive belt until it is lightly tensioned.
- Measure belt deflection as shown in photo.

Belt Deflection (Tension):

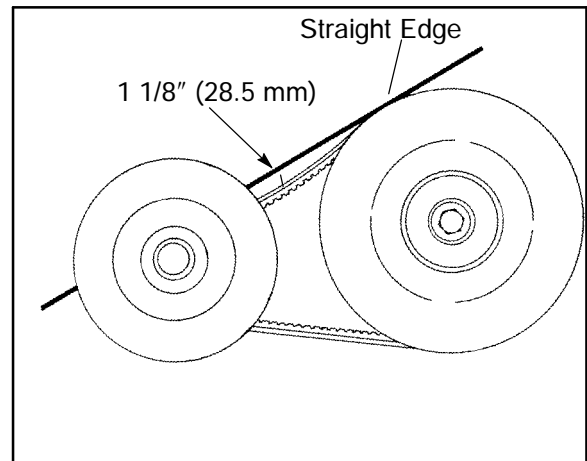
1 1/8" (2.9 cm) - 1 1/4" (3.2 cm)

If belt deflection is out of specification, adjust by removing or adding shims between the driven clutch sheaves.

- Remove shims to decrease belt deflection
- Add shims to increase belt deflection

See Driven Clutch Disassembly/Inspection, Pages 6.25 - 6.27.

NOTE: At least one shim must remain between the inner and outer sheave of the driven clutch. If proper belt deflection cannot be obtained, measure drive belt width, length, and center distance of drive and driven clutch, outlined in this section; all have an effect on belt deflection.



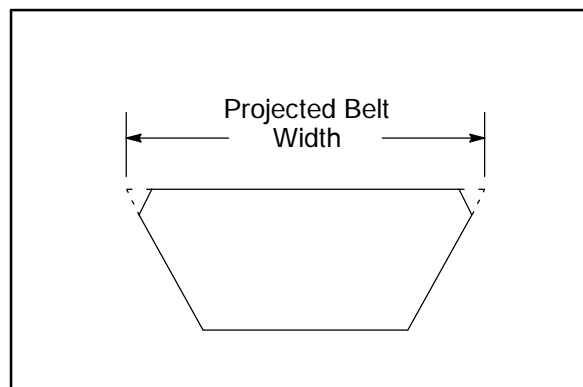


DRIVE BELT REMOVAL/INSPECTION

1. Remove outer PVT cover as described in PVT Disassembly.
2. Mark drive belt direction of rotation so that it can be installed in the same direction. **NOTE:** Normally positioned so part numbers are easily read.
3. To remove drive belt, apply brake, pull upward and rearward on belt to open driven clutch sheaves, pull out and down on belt to slip over the driven clutch outer sheave.



4. 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.
 - S 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.
 - S Place a straight edge on each side of the drive belt.
 - S Place another straight edge on top of belt.
 - S Measure the distance where the side straight edges intersect the top, as shown in the illustration at right.
5. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
6. 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 Width:

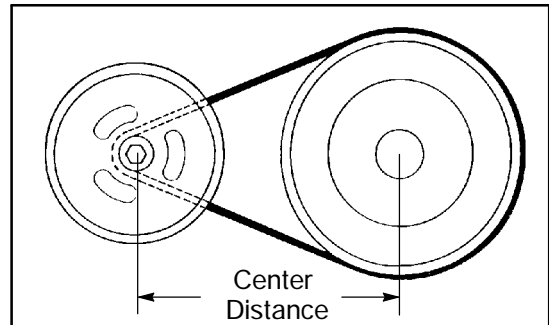
New 1.174 - 1.188"
(2.98-3.02 cm)

Wear Limit 1.125" (2.86 cm)



DRIVE BELT REMOVAL/INSPECTION, CONT.

7. Measure belt length with a tape measure around the outer circumference of the belt. Belts which measure longer than nominal length may require driven shimming or engine adjustment for a longer center distance to obtain proper belt deflection. Belts which measure shorter than nominal length may require driven shimming or a shorter center distance. *Remember, proper belt deflection is the desired goal - not a specific center distance.*
8. Replace belt if worn past the service limit. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See Troubleshooting Chart at the end of this chapter for possible causes. **NOTE:** If a new belt is installed, check belt deflection.



Clutch Center Distance -
10" +.1 / -.05 (254 +2.5 / -1.3mm)
Belt Nominal Length - 40.875" ± 3/16
(103.8 cm ± .48 cm)

DRIVE BELT INSTALLATION

1. Loop belt over drive and over top of driven sheave.
2. While pushing down on top of belt, turn the back or moveable driven sheave clockwise.
3. The belt then should be able to be pushed down into and between the sheaves.

NOTE: Be sure to position belt so part number is easily read.



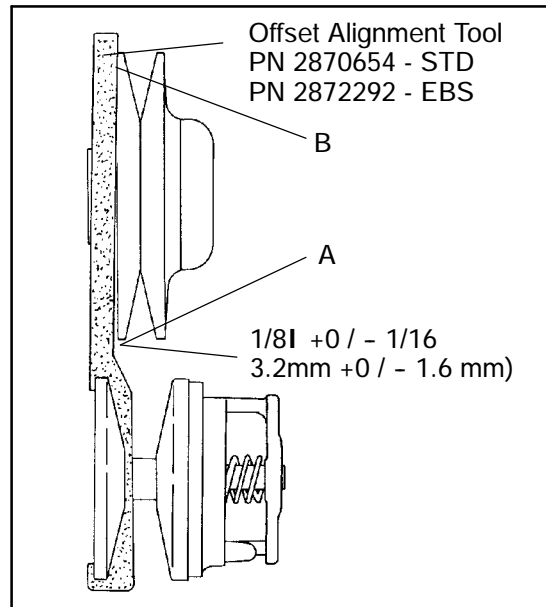


CLUTCH ALIGNMENT

1. Remove belt and install offset/alignment tool as shown.
2. With tool touching rear of driven clutch inner sheave, the distance at point "A" should be $1/8"$.

If the distance is greater than $1/8"$ or less than $1/16"$, clutch alignment must be adjusted as follows:

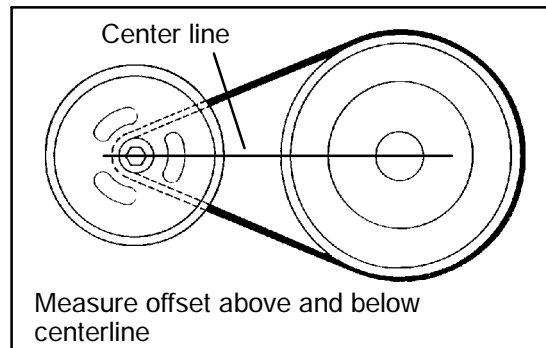
3. Remove drive and driven clutch. See PVT Disassembly, Pages 6.5 - 6.6.
4. Remove PVT inner cover.
5. Loosen all engine mounts. Move front of engine to the right or left slightly until alignment is correct.
6. Tighten engine mounts and verify alignment is correct.



7. Measure belt deflection and measure offset both above and below sheave centerlines. Adjust if necessary.

NOTE: On some models, minor adjustments can be made by adding shims between the frame and front lower left engine mount to increase the distance at point "A". If a shim is present, it can be removed to decrease the distance at point "A".

Shim Kit (PN 2200126)



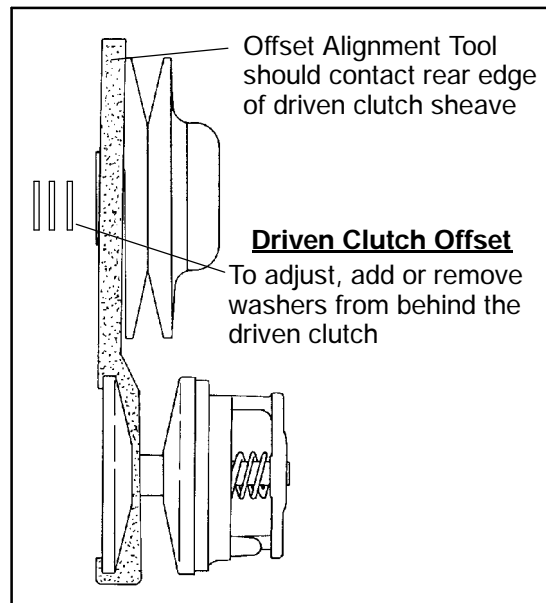
CLUTCH OFFSET

Important: Inspect clutch alignment and center distance before adjusting offset.

1. Install offset alignment tool as shown.

Offset is correct when rear of tool contacts rear of inner sheave with driven clutch pushed completely inward on shaft and bolt torqued. Adjust offset by adding or removing spacer washers between back of driven clutch and spacer as shown.

Spacer Washer (PN 7556401)





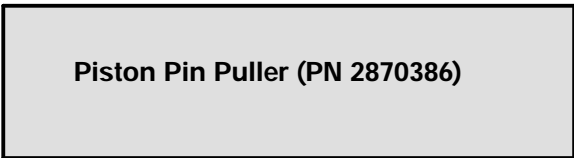
DRIVE CLUTCH BUSHING SERVICE

Polaris Kit - Clutch Bushing Replacement Tool Kit (PN 2871226)

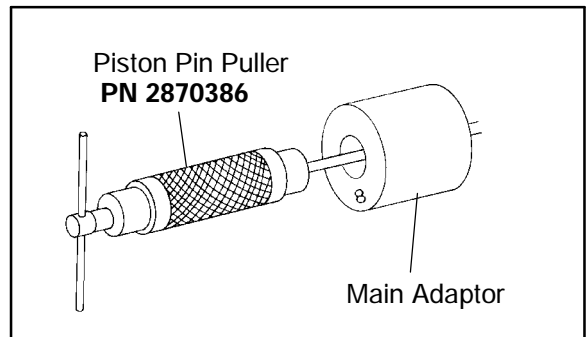
Item	Qty.	Part Description	Part No.
2	1	P-90 Drive Clutch and Driven Clutch Bushing Installation Tool	5020628
3	1	Drive Clutch Cover Bushing Removal and Installation Tool (for all drive clutches)	5020629
5	1	P-90 Driven Clutch Bushing Removal Tool	5020631
8	1	Main Puller Adapter	5020632
9	1	Adapter Reducer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

DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL

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.





DRIVE CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL, CONT.

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

1. Place main adapter (Item 8) on puller.
2. Apply Loctite[®] 680 retaining compound to the back side of new bushing. Push bushing into center of sheave on tower side by hand.

Bushing (PN 3576504)

Loctite[®] 680 (PN 2870584)

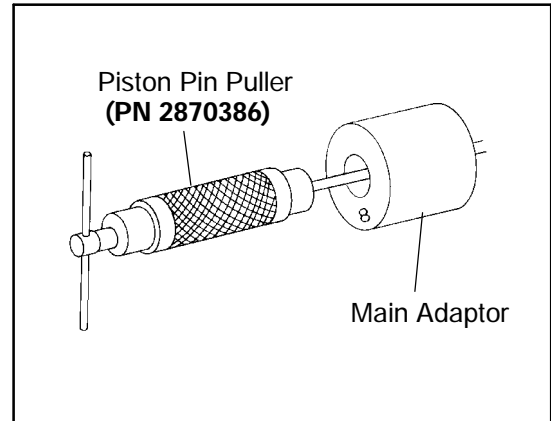
3. Insert installation tool (Item 2) into center of sheave and with towers pointing away from vise, slide sheave onto puller rod.
4. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
5. Turn sheave and barrel together counterclockwise until bushing is seated.
6. Remove nut from puller rod and set aside.
7. Remove sheave from puller.
8. Remove installation tool.





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.





DRIVE CLUTCH COVER - BUSHING INSTALLATION

1. Apply Loctite[®] 680 retaining compound to the back side of new bushing. Working from inside of cover, insert bushing and bushing installation tool into center of clutch cover.

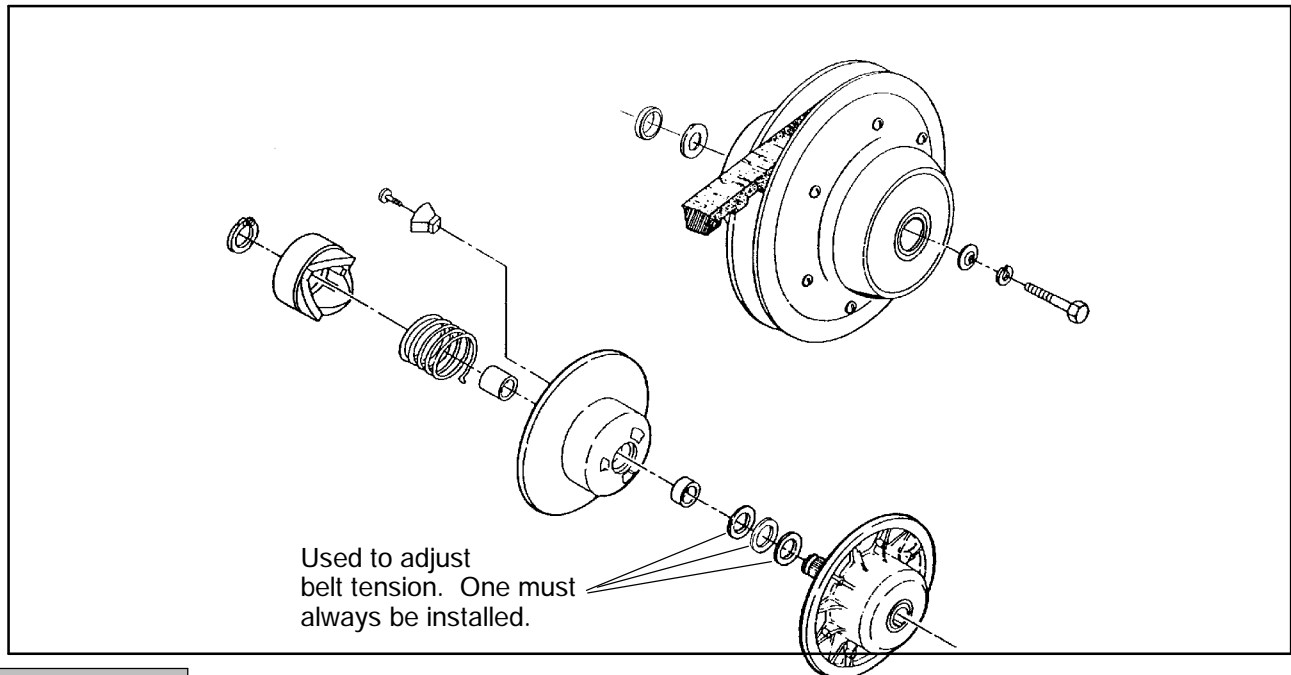
**Bushing (PN 3576510)
(Loctite[®] 680 PN 2870584)**

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





DRIVEN CLUTCH DISASSEMBLY/INSPECTION (NON EBS)



CAUTION:

Wear eye protection when removing snap ring to prevent serious personal injury.

1. Apply and hold downward pressure on the helix, or place driven clutch in Clutch Compression Tool (PN 8700220).
2. Remove snap ring retainer.



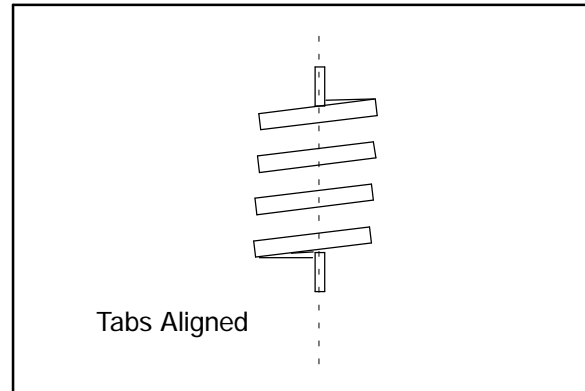
3. Note location of spring and remove helix.
4. Note location of spring in the moveable sheave, and remove the spring.





DRIVEN CLUTCH DISASSEMBLY / INSPECTION, CONT.

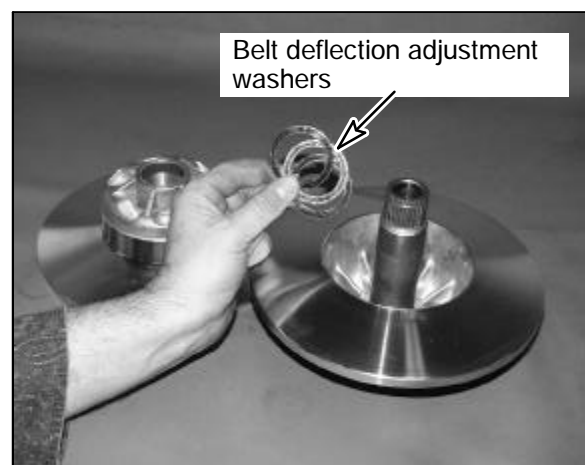
5. Check alignment of tabs on spring. Replace the spring if tabs are misaligned or the spring coils are distorted.



6. Inspect ramp buttons in the moveable sheave and replace if worn. **NOTE:** The ramp buttons are secured by Torx[®] screws (T20).



7. Remove moveable sheave and note the number of spacer washers. One spacer must remain between the sheaves when adjusting belt deflection.





DRIVEN CLUTCH DISASSEMBLY / INSPECTION, CONT.

8. Inspect the Teflon[®] coating on the moveable sheave bushing.

Moveable Sheave Bushing Inspection:

Replace the bushing if more brass than Teflon[™] is visible on the bushing. Refer to bushing replacement in this chapter.

9. Inspect driven clutch faces for wear or damage.
10. Clean and inspect splines on helix and transmission input shaft.
11. Lube splines with a light film of grease. **Do not lubricate the bushings!**





DRIVEN CLUTCH ASSEMBLY

1. Install moveable sheave with spacer washers. **Important:** At least one spacer washer must be installed. Teflon bushings are self-lubricating. Do not apply oil or grease to the bushings.
2. Install spring, inserting spring tab into proper hole in moveable sheave.
3. Insert spring tab into proper hole in helix. See specifications at the beginning of this section.

The driven clutch, helix/moveable assembly has several different spring locations which affect clutch shifting and RPMs. The greatest amount of spring tension will raise engine RPMs during clutch upshift and allow quicker backshift or downshift when pulling or negotiating a hill, for example. The least amount of tension will create a slower downshift and a harder upshift.

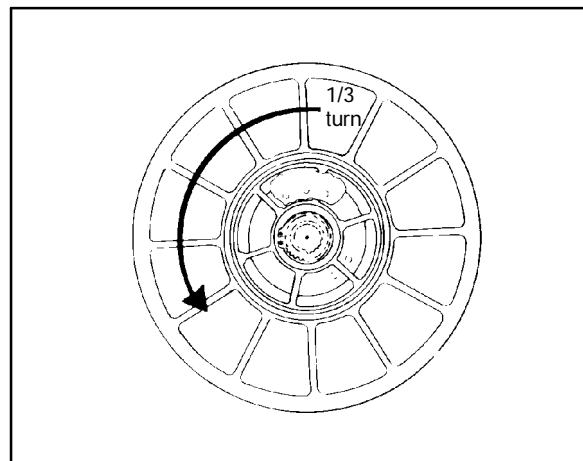
Example:	Helix	Moveable Sheave	Spring Tension
	2	- 1	Heavy
Spring/ Position	2	- 2	
	1	- 1	
	2	- 3	
	1	- 2	
	1	- 3	

Refer to General Information Chapter 1 for driven clutch spring color and production setting.

4. Line up boss spline and push helix down until it engages the splines 1/2" to 3/4".



5. While holding downward pressure on helix, wind moveable sheave counterclockwise approximately 1/3 turn (120°).
6. Push helix into place and install snap ring.

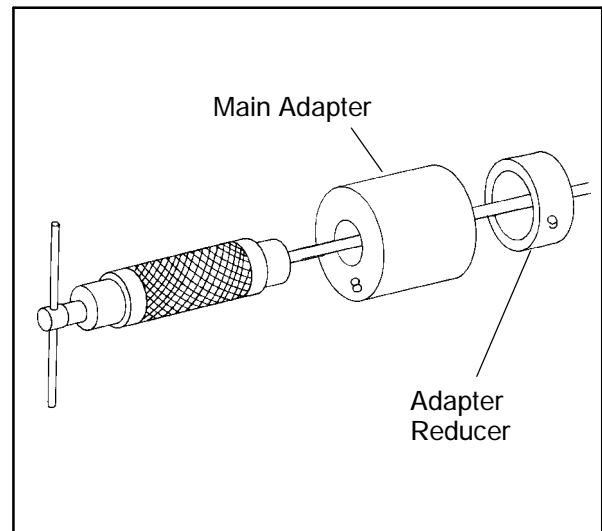




DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL

NOTE: Bushings are installed at the factory using Loctite. In order to remove the bushing it will be necessary to apply heat. A press can be used to remove and install some of the bushings. Be sure to support the sheave or cover as close as possible to the bushing bore when using a press.

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



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

CAUTION:

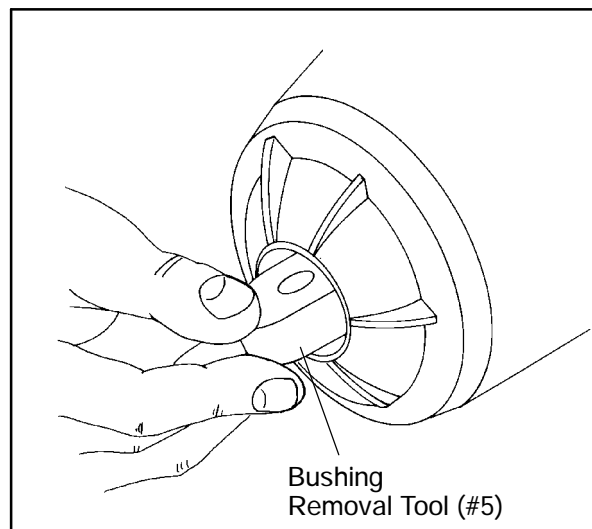
Clutch components will be hot! In order to avoid serious burns, wear some type of insulated gloves for the rest of the removal process.





DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING REMOVAL, CONT.

5. 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.



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



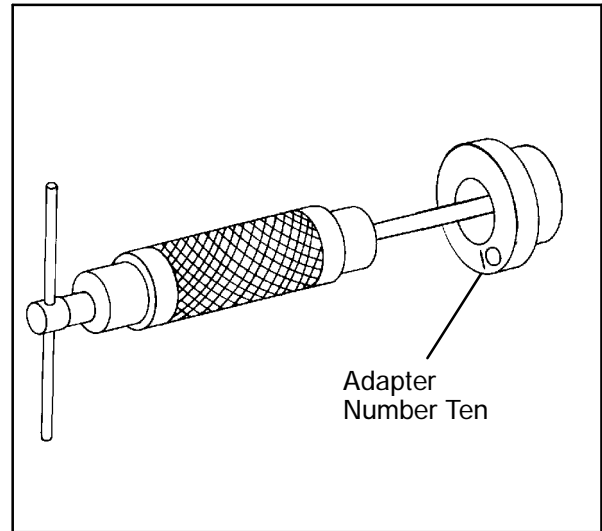
8. Turn clutch sheave counterclockwise until bushing is removed. Repeat Steps 5 - 8 for other bushing.
9. Remove nut from puller rod and set aside.
10. Remove adapters from puller.
11. Remove bushing and removal tool from adapters. Discard bushing.



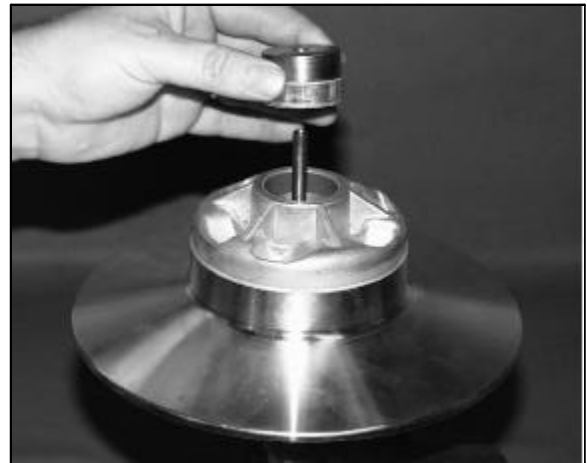


DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION

1. Working from the top, insert adapter number ten onto puller. See illustration at right.
2. Start new bushing evenly in moveable sheave. Apply Loctite[®] 680 retaining compound to the back side of new bushing.



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





DRIVEN CLUTCH MOVEABLE SHEAVE - BUSHING INSTALLATION, CONT.

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



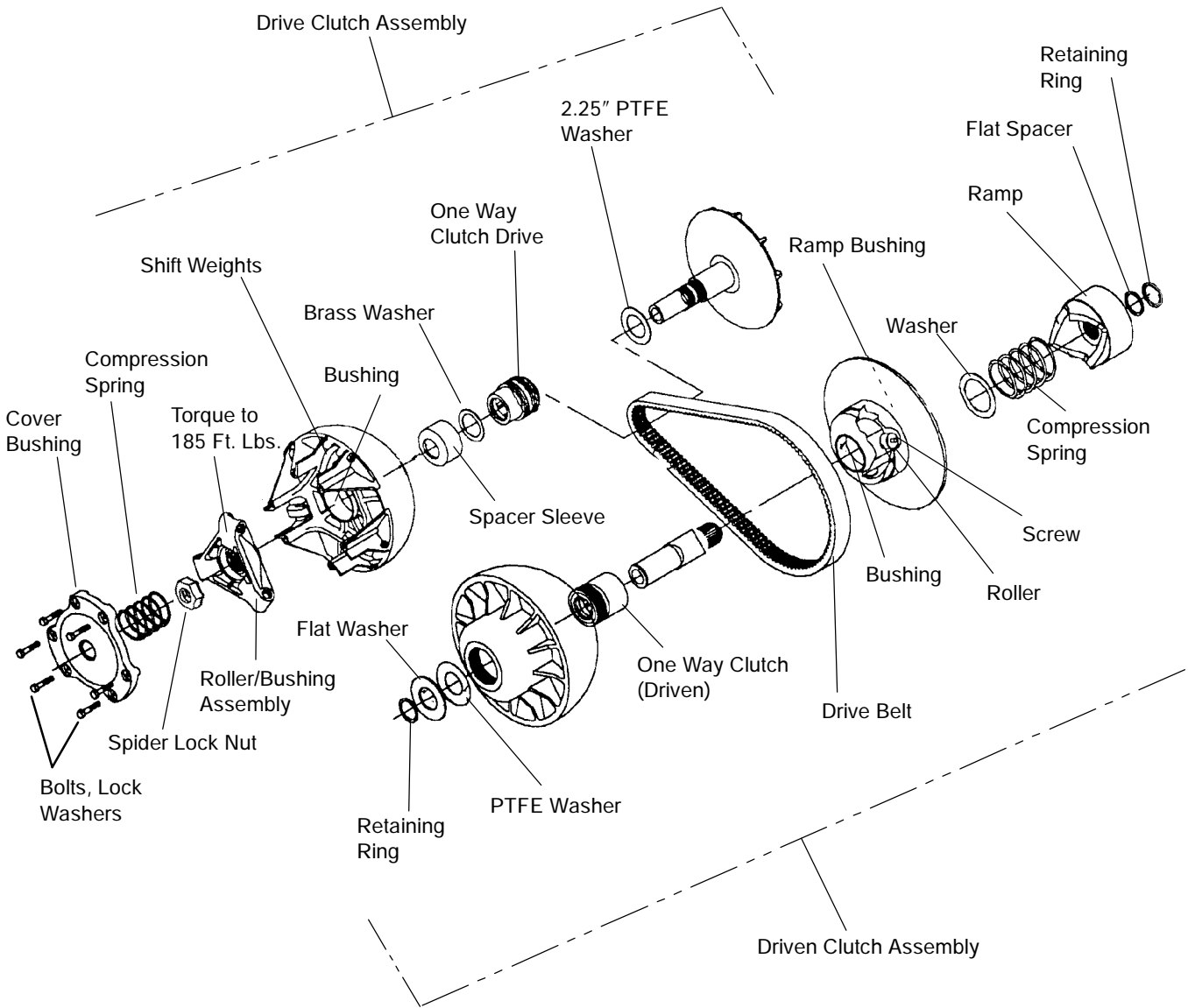
5. Turn clutch sheave counterclockwise until bushing is seated.
6. Remove nut from puller rod and set aside.
7. Remove installation tool and clutch sheave from puller.
8. Repeat installation procedure for other moveable bushing.

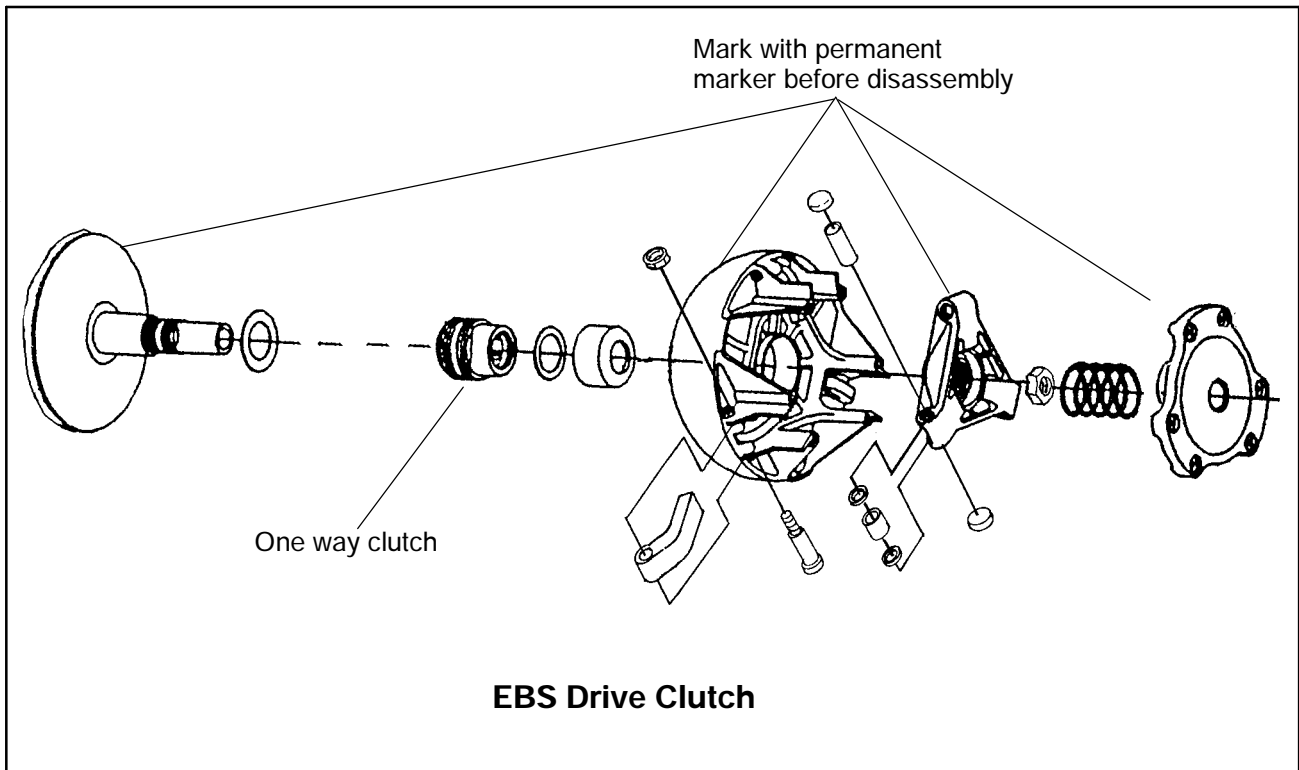




ENGINE BRAKING SYSTEM (EBS)

EBS Exploded View





ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH)

1. Rotate one-way clutch clockwise (as viewed from the cover plate side). The clutch should rotate on the shaft with only slight amount of drag. There should not be any binding or rough spots. When rotated counterclockwise, the clutch should lock to the shaft without slipping. If problems are noted in either direction, continue with disassembly.



DRIVE CLUTCH INSPECTION

NOTE: Remove cover, spring, and spider following instructions for standard (non EBS) drive clutch, then proceed as follows.

1. Remove moveable sheave spacer sleeve and the brass washer. Visually inspect the washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.

Brass Washer Thickness
Standard: .030" (.76mm)
Service Limit: .025" (.64mm)





DRIVE CLUTCH INSPECTION, CONT.

2. Remove moveable sheave.
3. Lift one-way clutch off shaft. Replace as an assembly if worn, damaged, or if problems were noted on Page 6.34.
4. Inspect surface of shaft for pitting, grooves, or damage. Measure the outside diameter and compare to specifications. Replace the drive clutch assembly if shaft is worn or damaged.

Shaft Diameter
Standard: 1.3745" - 1.375"
Service Limit: 1.3730"



5. Remove 2 1/2" PTFE washer from shaft. Visually inspect the washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.

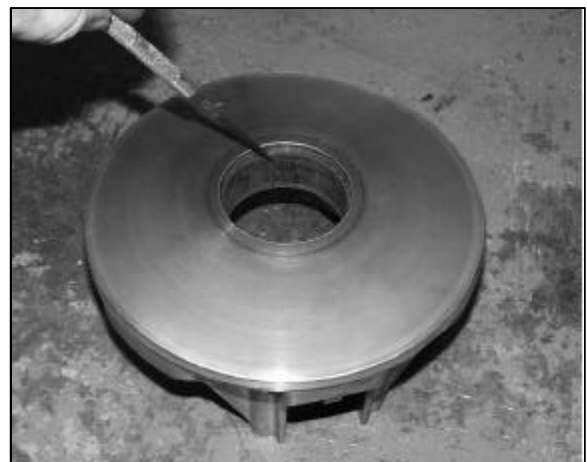
PTFE Washer Thickness
Standard: .030" (.76mm)
Service Limit: .025" (.64mm)



MOVEABLE SHEAVE BUSHING INSPECTION

1. Inspect the Teflon[®] coating on the moveable sheave bushing.

Moveable Sheave Bushing Inspection:
Replace the cover bushing if more brass than Teflon[®] is visible on the bushing. Refer to bushing replacement in this chapter.



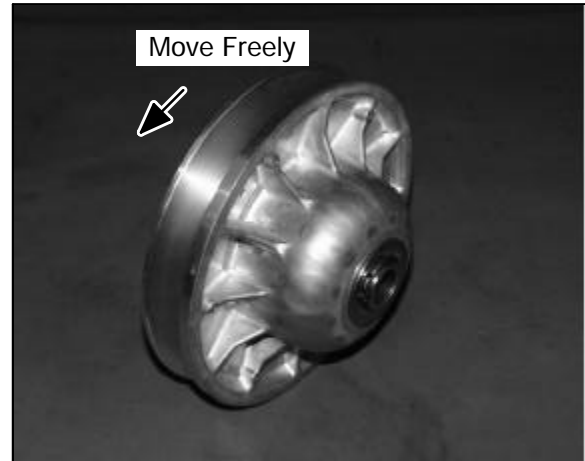


DRIVEN CLUTCH DISASSEMBLY/INSPECTION - EBS

CAUTION: The driven clutch must be disassembled from the helix end to lessen the chance of damage to seals in the one-way clutch. Review all information below before proceeding.

ONE-WAY CLUTCH PRELIMINARY INSPECTION (DRIVEN)

1. With drive belt removed and transmission in neutral, hold the outer sheave and rotate the inner sheave of the driven clutch (moveable) in a counterclockwise direction as shown at right. The sheave should rotate on the shaft with only a slight amount of drag. There should not be any binding or rough spots.



2. When rotated clockwise, the inner (moveable) sheave should lock to the shaft and outer sheave without slipping.



3. Remove driven clutch from the transmission input shaft. Do not disassemble the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side or the one-way clutch seals may be damaged.





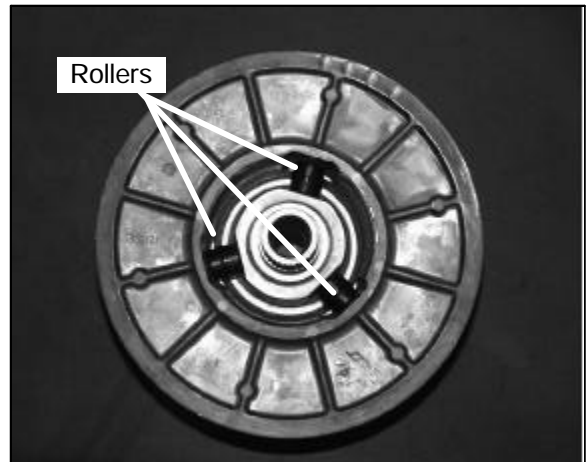
DRIVEN CLUTCH DISASSEMBLY/ INSPECTION, CONT.

4. Push helix inward. Remove snap ring, washer, helix, and spring. The spring is a compression spring only and has no torsional wind.

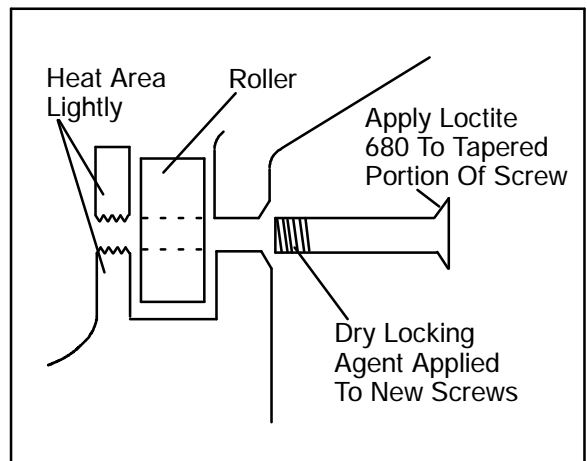
NOTE: Rotating the moveable sheave so that the rollers are not in contact with either helix ramp surfaces will lessen the effort needed to push helix inward.



5. Remove spring seat washer and inspect for wear or damage. Replace if worn.
6. Inspect surface of rollers for flat spots and wear. Rollers must rotate freely on pins without excessive clearance. Check the roller pin and roller bore for wear and replace if necessary.



NOTE: ROLLER PIN DISASSEMBLY New roller retaining bolts have a dry locking agent applied to the threads. Before attempting to remove the roller pins, heat the threaded area lightly with a propane torch. Use a high quality hexagonal wrench (Allent) in good condition to avoid screw damage. A small amount of valve grinding compound can be applied to the tip of the hex wrench to ensure a tight fit. Always use new bolts if they are removed for inspection. Apply Loctite® 680 retaining compound sparingly to the tapered head portion of the roller retaining screws. Do not allow locking agent to contact the inside of the rollers. Do not lubricate the roller or roller pin.





DRIVEN CLUTCH DISASSEMBLY/ INSPECTION, CONT.

7. Inspect moveable sheave bushing for wear.

Moveable Sheave Bushing Inspection:

Replace the bushing if more brass than Teflon[®] is visible on the surface of the bushing.



8. Check for movement of the driven clutch shaft in the one-way clutch. If the shaft can be moved laterally, or if the one-way clutch does not function properly as described in Step 1 and 2 on Page 6.36, replace driven clutch assembly.





BUSHING REPLACEMENT, EBS DRIVE

EBS CLUTCH BUSHING REMOVAL AND INSTALLATION

Use Tool Kit - EBS Bushing Replacement Kit (PN 2201379)

The contents of this kit include:

<u>Item</u>	<u>Qty.</u>	<u>Part Description</u>	<u>Part No.</u>
A/B	1	EBS Drive Clutch and Driven Clutch Puller Tool	5132027
C	1	EBS Drive Clutch and Driven Clutch Puller Nut	5132501
D	1	EBS Main Adapter	5132029
E	1	EBS Bushing Removal Tool	5132028
	1	Instruction	9915111

Also required:

Clutch Bushing Removal/Installation Tool Kit (**PN 2871226**) (ATV Clutch Kit) or (**2871025**) (For all clutches)

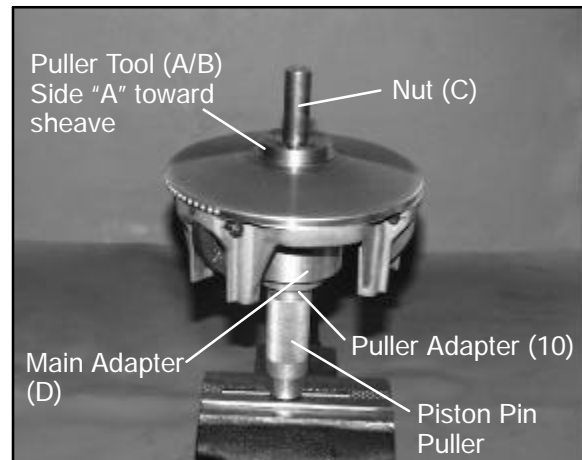
Piston pin puller (**PN 2870386**)

REMOVAL AND INSTALLATION INSTRUCTIONS

NOTE: Bushings are installed at the factory using Loctite[®] 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite from bushing bore prior to installing new bushing.

EBS Drive Clutch Moveable Sheave - Bushing Removal

1. Remove clutch as outlined previously in this chapter.
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 puller adapter (Item 10 from the Clutch Bushing Replacement Tool Kit (**PN 2871226**).
5. Install main adapter (Item D) onto puller.
6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A/B) into center of sheave with "A side" toward sheave.
8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
9. Turn sheave counterclockwise on puller rod until it comes free. Lift sheave off puller.
10. Remove nut from puller rod and set aside.
11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

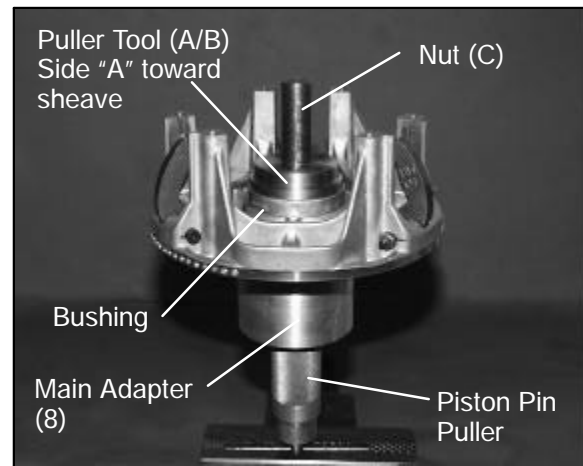




BUSHING REPLACEMENT, EBS DRIVE, CONT.

EBS Drive Moveable - Bushing Installation

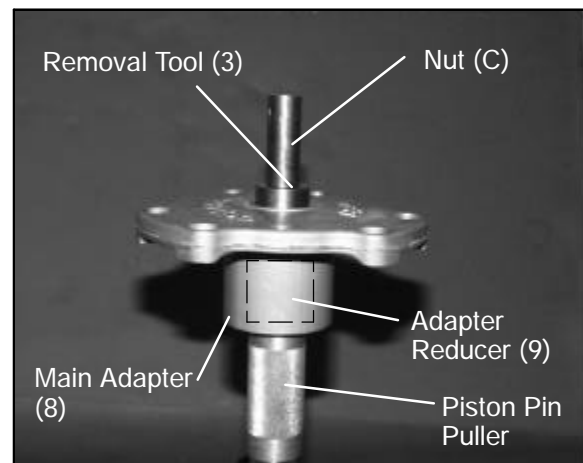
1. Place main adapter (Item 8) on puller.
2. Apply Loctite[®] 609 evenly to bushing bore inside moveable sheave.
3. Set bushing in place on sheave.
4. Insert installation puller tool (Item A/B) with "A" side down, into center of bushing.
5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
6. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
7. Turn sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut from puller rod and set aside.
9. Remove sheave from puller.
10. Remove installation tool.



EBS Drive Clutch Moveable Sheave Bushing Installation

EBS Clutch Cover - Bushing Removal

1. Install main adapter (Item 8) on puller.
2. Install adapter reducer (Item 9).
3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
4. With inside of cover toward vise, slide cover onto puller.
5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
6. Turn clutch cover counterclockwise on puller rod until bushing is removed and cover comes free.
7. Remove nut from puller rod and set aside.
8. Remove bushing and bushing removal tool from puller. Discard bushing.



EBS Drive Clutch Cover Bushing Removal

EBS Clutch Cover - Bushing Installation

1. Apply Loctite[®] 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new 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.





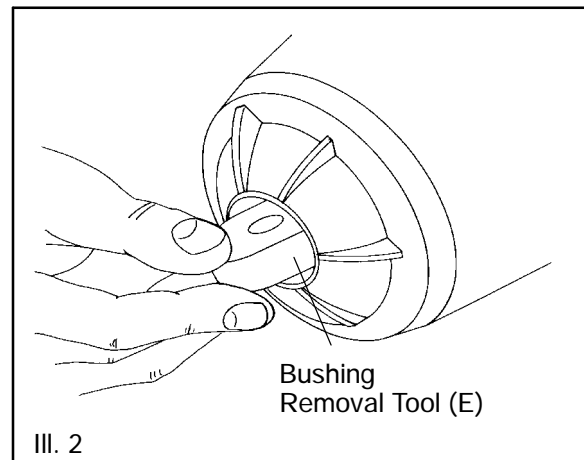
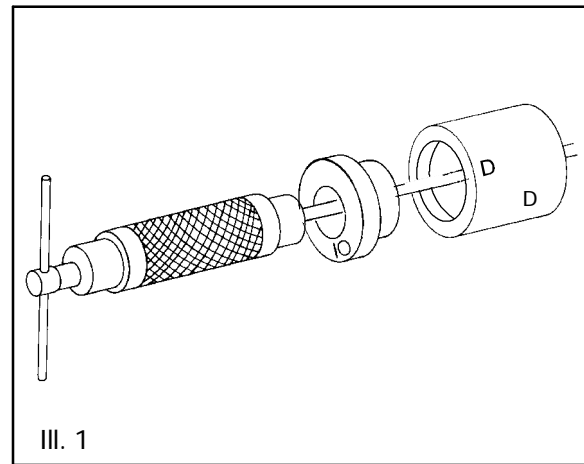
BUSHING REPLACEMENT, EBS DRIVEN

EBS Driven - Bushing Removal

1. Install puller adapter (Item 10) onto puller.
2. Insert EBS main adapter (Item D) onto puller. See III. 1.
3. Install bushing removal tool (Item E) into center of clutch sheave. See III. 2.
4. Install sheave onto puller.
5. Install left hand nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.

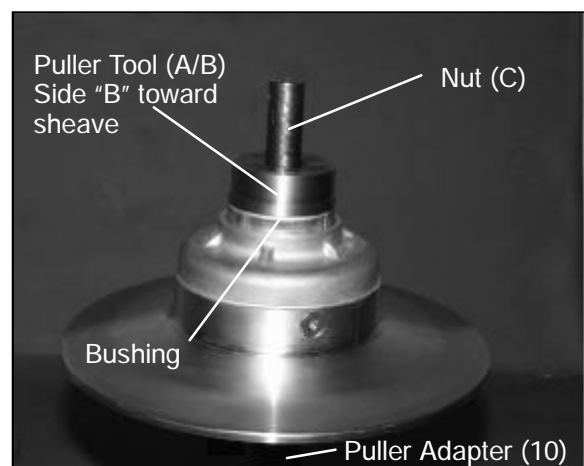
CAUTION: Clutch components will be hot! In order to avoid serious burns, wear some type of insulated gloves for the rest of the removal process.

7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.
10. Remove bushing and removal tool from adapters. Discard bushing.



EBS Driven - Bushing Installation

1. Slide adapter (Item 10) onto puller.
2. Apply Loctite[®] 609 evenly to bushing bore inside moveable sheave.
3. Install sheave onto puller (belt surface up).
4. Place new bushing on side B of installation tool (Item A/B) and slide both over puller rod.
5. Install nut (C) onto puller rod and hand tighten against installation tool.
6. Turn clutch sheave counterclockwise until bushing is seated.
7. Remove nut (C) (left hand thread) from puller rod and set aside.
8. Remove installation tool and clutch sheave from puller.



EBS Driven Clutch Bushing Installation



BUSHING REPLACEMENT, EBS DRIVEN, CONT.

EBS Driven - Backside (Outer) Bushing Removal

1. Install main puller adapter (Item 8) onto puller.
2. Install adapter reducer (Item 9).
3. Using a hand held propane torch, apply heat around outside of 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.

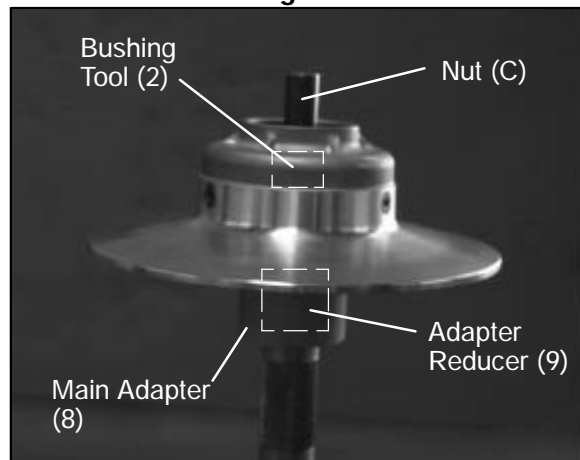
4. Flip sheave over onto puller.
5. Install bushing tool (Item 2).
6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.
10. Remove bushing and removal tool from adapters. Discard bushing.

EBS Driven - Backside (Outer) Bushing Installation

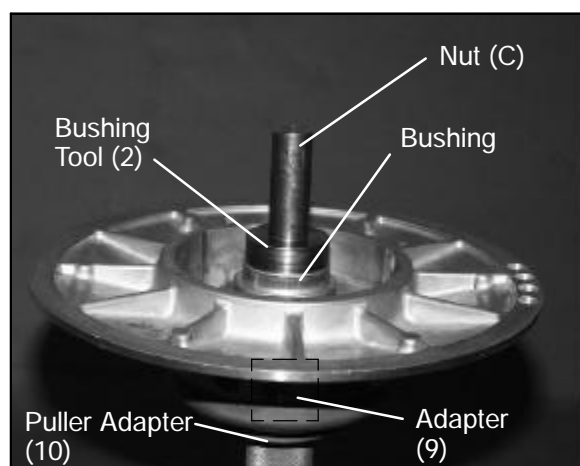
1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.
3. Apply Loctite® 609 evenly to bushing bore inside moveable sheave.
4. Install sheave face down on puller.
5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove installation tool and clutch sheave from puller.



Heat Bushing Surface Prior To Installation/ Removal OF Bushings



EBS Driven Clutch Outer Bushing Removal



EBS Driven Clutch Outer Bushing Installation



**TROUBLESHOOTING**

Situation	Probable Cause	Remedy
Engine RPM below specified operating range, although engine is properly tuned.	<ul style="list-style-type: none"> -Wrong or broken drive clutch spring. -Drive clutch shift weight too heavy. -Driven clutch spring broken or installed in wrong helix location. 	<ul style="list-style-type: none"> -Replace with recommended spring. -Install correct shift weight kit to match engine application. -Replace spring; refer to proper installation location.
Erratic engine operating RPM during acceleration or load variations.	<ul style="list-style-type: none"> -Drive clutch binding. -Belt worn unevenly - thin/burnt spots -Driven clutch malfunction. -Sheave face grooved. 	<ul style="list-style-type: none"> a. Disassemble drive clutch; inspect shift weights for wear and free operation. b. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area. Replace belt a. Replace ramp buttons. b. Inspect movable sheave for excessive bushing clearance/replace. -Replace the clutch.
Engine RPM above specified operating range.	<ul style="list-style-type: none"> -Incorrect drive clutch spring (too high spring rate). -Drive clutch shift weights incorrect for application (too light). -Drive clutch binding. -Driven clutch binding. -Converter sheaves greasy; belt slippage. 	<ul style="list-style-type: none"> -Install correct recommended spring. -Install correct recommended shift weights. -Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause. -Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location. -Clean sheaves with denatured alcohol or brake cleaner, install new belt.
Harsh drive clutch engagement.	<ul style="list-style-type: none"> -Drive belt worn too narrow. -Excessive belt/sheave clearance with new belt. 	<ul style="list-style-type: none"> -Replace belt. -Perform belt/sheave clearance adjustment with shim washers beneath spider.
Drive belt turns over	<ul style="list-style-type: none"> -Wrong belt for application. -Clutch alignment out of spec. -Engine mount broken or loose. 	<ul style="list-style-type: none"> -Replace with correct belt. -Adjust alignment offset. -Inspect/adjust or replace.
PVT cover overheating (melting)	<ul style="list-style-type: none"> -Plugged air intake or outlet -Belt slippage due to water, oil, grease, etc., rubbing on cover -Clutches or weight being applied to cover while in operation -High vs. low range 	<ul style="list-style-type: none"> -Clear obstruction. -Inspect system. Clean, repair or replace as necessary. Seal PVT system ducts. -Remove weight. Inform operator. -Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.
Water ingestion	<ul style="list-style-type: none"> -Cover seals or ducts leaking -Operator error 	<ul style="list-style-type: none"> -Find leak and repair as necessary. -Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.



TROUBLESHOOTING

Situation	Probable Cause	Remedy
Belt slippage	<ul style="list-style-type: none"> -Belt worn out -Water ingestion -Belt contaminated with oil or grease 	<ul style="list-style-type: none"> -Replace belt. -Inspect and seal PVT system. -Inspect and clean.
Belt burnt, thin spots	<ul style="list-style-type: none"> -Abuse (continued throttle application when vehicle is stationary, excess load) -Dragging brake -Slow, easy clutch engagement 	<ul style="list-style-type: none"> -Caution operator to operate machine within guidelines. -Vehicle operated with park brake on. Inspect brake system. -Fast, effective use of throttle for efficient engagement.
PVT noise	<ul style="list-style-type: none"> -Belt worn or separated, thin spots, loose belt -Broken or worn clutch components, cover hitting clutches 	<ul style="list-style-type: none"> -Replace belt. -Inspect and repair as necessary.
Engagement erratic or stabby	<ul style="list-style-type: none"> -Thin spots on belt, worn belt -Drive clutch bushings stick 	<ul style="list-style-type: none"> -Replace belt. Refer to belt burnt troubleshooting and instruct operator. -Inspect and repair clutches.

