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### Section 05 TRANSMISSION

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</tbody>
</table>
DRIVE BELT

APPLICATION CHART

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NUMBER</th>
<th>WIDTH (new) ± 0.25 mm (.010 in)</th>
<th>MINIMUM WIDTH (wear limit) mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All fan cooled models except Summit 500 F</td>
<td>415 060 600</td>
<td>34.70 (1.366)</td>
<td>32.30 (1.272)</td>
</tr>
<tr>
<td>Summit 500 F</td>
<td>417 300 066</td>
<td>35.10 (1.382)</td>
<td>33.00 (1.299)</td>
</tr>
<tr>
<td>All 493 and 593 engine equipped models</td>
<td>414 860 700</td>
<td>35.30 (1.390)</td>
<td>32.30 (1.272)</td>
</tr>
<tr>
<td>except Summit 600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 693 and 793 engine equipped models and</td>
<td>417 300 127</td>
<td>36.35 (1.431)</td>
<td>33.35 (1.313)</td>
</tr>
<tr>
<td>Summit 600</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INSPECTION

Inspect belt for cracks, fraying or abnormal wear (uneven wear, wear on one side, missing cogs, cracked fabric). If abnormal wear is noted, probable cause could be pulley misalignment, excessive RPM with frozen track, fast starts without warm-up period, burred or rusty sheave, oil on belt or distorted spare belt.

Check the drive belt width. Replace the drive belt if width is less than the minimum width recommended (see table above).

CHECKING NEUTRAL FUNCTION

WARNING
Always check neutral function when servicing.

Apply parking brake. Vehicle must be on the ground and on a plane level surface. No one should be in front of vehicle.

Attach vehicle tether cord to your clothing. Stand aside of vehicle then, start engine.

WARNING
Do not sit on vehicle.

Release parking brake. Vehicle must not creep when engine is idling. Otherwise, make sure that:

- idle speed is as specified
- proper belt is installed
- pulley center-to-center is as specified
- belt deflection is as specified.

ROTATION DIRECTION

The maximum drive belt life span is obtained when the drive belt is installed as shown. This will ensure that correct direction of rotation is respected.
Section 05  TRANSMISSION
Subsection 02  (DRIVE BELT)

NOTE: For used drive belt, mark and reinstall in the same position.

DRIVE BELT HEIGHT MEASUREMENT AND ADJUSTMENT

Measurement

Before checking the belt height, ensure that a good-condition proper belt (refer to the Application Chart) is installed.

Adjust pulley distance and alignment. Refer to PULLEY DISTANCE AND ALIGNMENT.

To obtain maximum vehicle performance, the belt height must be adjusted according to specifications shown in the accompanying chart.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>BELT HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models</td>
<td>Top edge of drive belt cord should be flush with driven pulley edge</td>
</tr>
</tbody>
</table>

Adjustment

Before adjusting the belt height, ensure that a good-condition proper belt (refer to the Application Chart) is installed.

Adjust pulley distance according to specification, refer to PULLEY DISTANCE AND ALIGNMENT.

Models Equipped with Formula Type Driven Pulley

Adjust drive belt height using Allen screws, as shown.

To lower belt in driven pulley: turn Allen screws clockwise.

To raise belt in driven pulley: turn Allen screws counterclockwise.

NOTE: Turn Allen screws 1/4 turn at a time, then rotate driven pulley to allow drive belt to settle in pulley. Check height, repeat as required.
Section 05  TRANSMISSION
Subsection 02  (DRIVE BELT)

TYPICAL
1. Allen screws with jam nuts

Allen screws must be restrained while tightening jam nut to prevent throwing adjustment out. Use drive belt tension adjuster (P/N 529 008 700).

NOTE: To obtain an accurate drive belt deflection measurement, it is suggested to allow a break-in period of 50 km (30 m.).
Before checking the belt deflection, ensure vehicle has the proper belt (refer to the Application Chart).
Adjust pulley distance and alignment. Refer to PULLEY DISTANCE AND ALIGNMENT.
To obtain maximum vehicle performance, the belt tension must be adjusted according to specifications shown in the accompanying chart.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DEFLECTION† mm (in)</th>
<th>FORCE kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models</td>
<td>32 ± 5 (1.260 ± .197)</td>
<td>11.5 (25)</td>
</tr>
</tbody>
</table>

† FOR REFERENCE ONLY

To Check Tension
Position a reference rule on drive belt.

Wooden Stick and Spring Scale Method

1. Mark specified deflection
Using spring scale and stick, apply specified force on drive belt halfway between pulleys as shown.

DRIVE BELT DEFLECTION MEASUREMENT (reference only)

NOTE: The drive belt deflection measurement must be performed each time a new drive belt is installed.

Models Equipped with HPV27 Type Driven Pulley
Loosen screws and turn adjustment ring accordingly. Retighten screws.
Or use the belt tension tester (P/N 414 348 200).

1. Slide lower O-ring of deflection scale to specified measure.
2. Slide upper O-ring to 0 (zero) on the force scale.
3. Apply pressure until lower O-ring is flush with edge of rule and read force on the upper scale at top edge of O-ring.
DRIVE PULLEY

BOMBARDIER LITE

NOTE: This is a lubrication free drive pulley.

377 Engine ZX Series
GENERAL
Some drive pulley components (return spring, calibration disk) can be changed to improve vehicle performance in high altitude regions. A service bulletin will give information about calibration according to altitude.

CAUTION: Such modifications should only be performed by experience mechanics since they can greatly affect vehicle performance.

WARNING
Any drive pulley repairs must be performed by an authorized Bombardier snowmobile dealer. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.

REMOVAL
NOTE: If disassembling drive pulley, first straighten tab washer no. 7 then untighten nut no. 8.

WARNING
Never use an impact wrench to remove or install the drive pulley.

WARNING
The drive pulley assembly is a precisely balanced unit. Never replace parts with used parts from another drive pulley assembly.

Use holder (P/N 529 027 600).
Remove retaining screw no. 9.

Typical
Insert drive pulley puller (P/N 529 031 400) then remove drive pulley.
DISASSEMBLY

Unscrew nut. Remove tab washer.
Check for alignment marks for proper indexing at reassembly.

1. Alignment marks
Identify blocks no. 1 and their respective positive positions for reassembly.

2. Cap, Washer and Disk
These are calibration parts. Refer to TECHNICAL DATA.
Install spring cover tool (P/N 529 027 300) with puller (P/N 529 031 400) on spring cover.

CLEANING

Clean pulley faces and shaft with fine steel wool and clean dry cloth. Clean sliding half bushing with clean dry cloth.

INSPECTION

Check sliding half for excessive lateral play and fixed half shaft for scratches. Replace as required.

ASSEMBLY

Install circlip no. 11 then washer no. 10.
Make sure to install blocks at their original position and with their curved end toward governor cup. See following illustration.
Tighten nut no. 8 to 128 N•m (95 lbf•ft).
INSTALLATION

Torque screw to 80 to 100 N\cdot m (59 to 74 lbf\cdot ft).
Install drive belt and belt guard.
Raise and block the rear of the vehicle and support it with a mechanical stand.

⚠️ WARNING

Ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake, repeat 5 times.
Retorque screw to 90 to 100 N\cdot m (66 to 74 lbf\cdot ft).

⚠️ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.
TRA

Grand Touring Fan 500, MX Z Fan 500, Summit Fan 500, Legend Fan 500 and All Liquid Cooled ZX Series Models

NOTE: This is a lubrication free drive pulley.
GENERAL

Some drive pulley components (return spring, ramp) can be changed to improve vehicle performance in high altitude regions. A service bulletin will give information about calibration according to altitude.

**CAUTION:** Such modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance. Verify spring specifications before installation. Do not only refer to the spring color code.

**NOTE:** TRA drive pulley stands for Total Range Adjustable drive pulley.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any drive pulley repairs must be performed by an authorized Bombardier snowmobile dealer. Sub-component installation and assembly tolerances require strict adherence to procedures detailed.</td>
</tr>
</tbody>
</table>

REMOVAL

30,31, Conical Spring Washer and Screw

Use holder (P/N 529 006 400).

Remove retaining screw.

To remove drive pulley ass’y and/or fixed half from engine, use puller (P/N 529 007 900) for 503 engine equipped models and puller (P/N 529 022 400) for liquid cooled models.

**CAUTION:** These pulleys have metric threads. Do not use imperial threads puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs imperial) prior to fully tightening.

To Remove Drive Pulley Ass’y:

Retain drive pulley with clutch holder.

Install puller in pulley shaft then tighten.

DISASSEMBLY

1,2, Screw and Ring Gear

**CAUTION:** Retaining screws must be heated before disassembly. Do not exceed 150°C (300°F).

5,6, Fixed and Sliding Half

**CAUTION:** Do not tap on governor cup.

Screw puller into fixed half shaft about 13 mm (1/2 in).

Raise drive pulley and hold it by the sliding half while knocking on puller head to disengage fixed half.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never use any type of impact wrench at drive pulley removal and installation.</td>
</tr>
</tbody>
</table>

TYPICAL

1. Retaining screw
2. Insert in any slot

NOTE: No components marking is required before disassembling this drive pulley since it has factory mark and arrows as indexing reference.
32, Cushion Drive

**CAUTION:** Do not disassemble cushion drive. Governor cup and cushion drive are factory balanced as an assembly.

25, 29, Slider Shoe and Governor Cup

Carefully lift governor cup until slider shoes come at their highest position into guides. Hold a slider shoe set then carefully lift its housing and remove slider shoes. Proceed the same way for other housings lifting one at a time.

1. Hold slider shoes
2. Lift one housing at a time

**NOTE:** To ease disassembly, forks (P/N 529 005 500) should be used to hold slider shoes prior to removing governor cup.

19, Spring Cover Ass’y

It is pushed by clutch spring pressure.

**WARNING**

Clutch spring is very strong. Never attempt to remove spring cover without the recommended tools.

Use spring compressor (P/N 529 035 524). Install support guide.

Install sliding half then a second support guide. These support guides will prevent bushing damages.

Remove 3 Allen screws retaining spring cover then unscrew compressor.
CLEANING

5,6, Fixed and Sliding Half
Clean pulley faces and shaft with fine steel wool and dry cloth.

5, Fixed Half and Crankshaft End
Parts must be at room temperature before cleaning.
Using a paper towel with cleaning solvent, clean crankshaft tapered end and the taper inside the fixed half of the drive pulley, crankshaft threads and retaining screw threads.

<table>
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<th>WARNING</th>
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<tbody>
<tr>
<td>This procedure must be performed in a well-ventilated area.</td>
</tr>
</tbody>
</table>

**CAUTION:** Avoid contact between cleaner and crankshaft seal because damage may occur.
Remove all hardened oil deposits that have baked on crankshaft and pulley tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

**CAUTION:** Do not use any other type of abrasive.
Reclean mounting surfaces with paper towel and cleaning solvent.
Wipe off the mounting surfaces with a clean, dry paper towel.

**CAUTION:** Mounting surfaces must be free of any oil, cleaner or towel residue.

7,20, Bushing
Only use petrol base cleaner when cleaning bushings.

**CAUTION:** Do not use acetone to clean bushing.

INSPECTION

Drive pulley should be inspected annually.

16,17, Thrust Washer and Roller
Check roller for roundness of external diameter. Check thrust washer for thickness wear. Replace as required.

**CAUTION:** Ensure rollers are in good condition. Replace as required.

9,12, Fitting Bolt Ass’y and Flanged Bushing
Check for wear, replace as required.

24,25, O-Ring and Slider Shoe
Check if O-rings are cracked, cut or crushed. Replace as required.
Check slider shoes for wear. Replace if groove is not apparent on top.

5,29, Fixed Half and Governor Cup
Inspect splines and free play between both parts. Maximum free play is 0.5 mm (.020 in) measured at calibration screw radius. Replace if required.

7,20, Sliding Half and Spring Cover Bushing
Visually inspect coating. Replace if worn.

**Sliding Half Bushing Replacement**
This bushing is not replaceable. If worn out, replace sliding half ass’y.

**Spring Cover Bushing Replacement**
Under normal use there is no need to replace this bushing.
Mount compressor (P/N 529 035 524) in a vise.
Use tools (P/N 529 031 300 and 529 031 200) to remove old bushing.

**CAUTION:** Bushing must be bonded with retaining compound.
Apply retaining compound Loctite 609 outside of bushing then press it down to counterbore from outside end.

**CAUTION:** Insert bushing from sliding half side (inner side) of spring cover.

**ASSEMBLY**

**NOTE:** This drive pulley is lubrication free. Do not lubricate any component.

1,2,3, Screw, Ring Gear and Loctite 271

Apply Loctite 271 (P/N 413 702 900) on threads and then torque to 27 N•m (20 lbf•ft).

26,27,28, Calibration Screw, Washer and Locking Nut

When installing calibration screw, make sure to install washer as shown.

21,22,23, Screw, Dowel Tube and Ramp

Insert dowel tube from chamfered side. Make sure ramp is centered on dowel tube.

1. Washer

Torque locking nut to 10 N•m (89 lbf•in).

15, Pin

Always use the same type of pin as originally installed when servicing. Different types have different weights for calibration purpose. Refer to TECHNICAL DATA.

1. Equal distance

Torque screws to 10 N•m (89 lbf•in).
9, 11, 13, 14, Screw, Lever Ass’y, Nut and Cotter Pin

Always install lever assemblies so that cotter pins are on the shown side. Besides install cotter pin head on top when lever is sat at bottom of sliding half. Bend cotter pin ends to sit perfectly against lever.

**WARNING**
Whenever replacing centrifugal levers, always replace all 3 at the same time. Otherwise, drive pulley misbalancing will occur because of levers difference.

**CAUTION:** Lever assemblies must be installed so that cotter pins are on the same side. Torque nuts to 12 N•m (106 lbf•in).

**CAUTION:** Lever ass’y and rollers must move easily after installation.

33, Guard

*Some Models Only*
Install guard with its reinforcements in line with levers.

5, 6, 18, 19, Fixed Half, Sliding Half, Spring, Spring Cover and Screw

To install spring cover, use spring compressor (P/N 529 035 524).

Assemble fixed and sliding halves. Note that fixed halves have different cone angle. Match cone angle with crankshaft.

Lift sliding half against spring cover and align spring cover arrow with sliding half mark.

**WARNING**
Whenever replacing centrifugal levers, always replace all 3 at the same time. Otherwise, drive pulley misbalancing will occur because of levers difference.
6,25,29, Sliding Half, Slider Shoe and Governor Cup

To install governor cup, use following tool:

Insert spring and slider shoes into governor cup so that groove in each slider shoe is vertical to properly slide in guides.

**CAUTION:** Make sure O-rings are installed on slider shoes and that grooves are positioned vertically.

Install fork (P/N 529 005 500) into slider shoe grooves to maintain them for governor cup installation. Proceed on 3 set of slider shoes.

Make sure to align governor cup arrow with sliding half and fixed half mark.

**NOTE:** If fixed half has no mark, align governor cup mark with segment no. 1 of inner half. Segments are identified on engine side.

**INSTALLATION**

- **WARNING**
  Do not apply anti-seize or any lubricant on crankshaft and drive pulley tapers.

- **WARNING**
  Never use any type of impact wrench at drive pulley removal and installation.

Carefully slide governor cup into sliding half. Align mark of governor cup with mark of fixed half.

Remove forks and push governor cup so that its splines engage with fixed half shaft splines.

**CAUTION:** Make sure splines of both parts are fully engaged.
Drive Pulley Ass’y

The following installation procedure must be strictly adhered.
Install drive pulley on crankshaft extension.
Install a new conical spring washer with its concave side towards drive pulley then install screw.

> WARNING

Never substitute conical spring washer and/or screw with jobber ones. Always use Bombardier genuine parts for this particular case.

Use holder. See removal procedure.
Torque screw to 80 to 100 N•m (59 to 74 lbf•ft).
Install drive belt and guard.
Raise and block the rear of the vehicle and support it with a mechanical stand.

> WARNING

Ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 30 km/h (20 MPH)) and apply the brake, repeat 5 times.
Retorque screw to 90 to 100 N•m (66 to 74 lbf•ft).

> WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure the retaining screw is properly torqued.

DRIVE PULLEY ADJUSTMENT

The drive pulley is factory calibrated to transmit maximum engine power at a predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.
This adjustable drive pulley allows setting maximum engine RPM in the vehicle to maintain maximum power.
Calibration screws should be adjusted so that actual maximum engine RPM in vehicle matches with the maximum horsepower RPM given in TECHNICAL DATA.

NOTE: Use precision digital tachometer for engine RPM adjustment.
NOTE: The adjustment has an effect on high RPM only.
To adjust, modify ramp end position by turning calibration screws.

26,28,29, Calibration Screw, Locking Nut and Governor Cup

Calibration screw has a notch on top of its head.

1. Notch

Governor cup has 6 positions numbered 2 to 6. Note that in position 1 there is no stamped number (due to its location on casting).
See TECHNICAL DATA for original setting.

1. Position 1 (not numbered)

Each number modifies maximum engine RPM by about 200 RPM.
Lower numbers decrease engine RPM in steps of 200 RPM and higher numbers increase it in steps of 200 RPM.
Example:
Calibration screw is set at position 3 and is changed to position 5. So maximum engine RPM is increased by about 400 RPM.

To Adjust:
Just loosen locking nut enough to pull calibration screw partially out and adjust to desired position. Do not completely remove the locking nut. Torque locking nuts to 10 N•m (89 lbf•in).

**CAUTION:** Do not completely remove calibration screw otherwise its inside washer will fall off.

**CAUTION:** Always adjust all 3 calibration screws and make sure they are all set at the same number.

![Diagram](image.png)

1. Loosen just enough to permit rotating of calibration screw
DRIVEN PULLEY

LPV27

ZX Series Fan Cooled
DISASSEMBLY

Use spring compressor (P/N 529 035 524).

**WARNING**

Driven pulley cam is spring loaded, use above mentioned tool.

INSPECTION

Replace bushing(s) if worn more than specified.

<table>
<thead>
<tr>
<th>DRIVEN PULLEY BUSHING WEAR LIMIT</th>
<th>mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small bushing</td>
<td>38.30 (1.508)</td>
</tr>
<tr>
<td>Large bushing</td>
<td>108.2 (4.260)</td>
</tr>
</tbody>
</table>

10,11, Slider Shoe

Black slider shoe = forward.
Red slider shoe = reverse.
Check cam slider shoes for wear. Replace when inside edge thickness of cam slider shoe slope base is worn to 1 mm (.039 in) or less.

**Bushing Replacement**

**Large Bushing**

Remove Allen screws if applicable. Heat to break Loctite bond.
Install support plate included in tool (P/N 529 031 100) inside sliding half.
Place extractor (P/N 529 035 575) below bushing.

**WARNING**

Driven pulley cam is spring loaded, use above mentioned tool.

**DRIVEN PULLEY BUSHING WEAR LIMIT**

<table>
<thead>
<tr>
<th>mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small bushing</td>
</tr>
<tr>
<td>Large bushing</td>
</tr>
</tbody>
</table>

Mount screw head of new puller (P/N 529 035 524) in a vise.
Turn pulley half by hand to extract old bushing.
Before bushing installation, file sliding half bore to remove burrs from crimping areas.
Coat bushing outside diameter with Loctite 609 (P/N 413 703 100). Place new bushing on sliding half and slightly tap to engage squarely the bushing in the sliding.
ASSEMBLY

10,11, Cam Slider Shoe
When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam. Install slider shoes as per following photo. Red slider shoes are being used for reverse and black ones for forward.

Position guard no. 6 in cam no. 5 then insert spring in adjusting hole no. 3 (mid-hole) into outer cam. Compress outer cam using spring compressor (P/N 529 035 524).

INSTALLATION

1, Countershaft
CAUTION: Always apply anti-seize lubricant (P/N 413 701 000) on the countershaft before final pulley installation.
Make sure that spacer no. 2 is on countershaft before installing driven pulley. Note also that washer shoulder is facing driven pulley.

**TYPICAL**
1. Spacer
2. Shoulder on this side

Should installation procedure be required, refer to BRAKE then look for Brake Disc and Countershaft Bearing Adjustment.

Reinstall the pulley on the countershaft by reversing the removal procedure.

**14, Pulley Retaining Screw**
Torque to 25 N•m (18 lbf•ft).

**ADJUSTMENT**

Pulley Alignment and Drive Belt Deflection
Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.

**CAUTION:** Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.
REMOVAL

Remove guard and drive belt from vehicle.
Remove cap screw no. 12 and shouldered washer no. 11 then pull the driven pulley from the countershaft.
Note shouldered washer position for reinstallation.
Take care not to loose spacer no. 2.

Remove snap ring no. 3 and washer no. 4 to disassemble the cam and the 2 pulley halves.

**WARNING**
Driven pulley cam is spring and/or torsion loaded, use above mentioned tool.

CLEANING

9,10, Large Bushing and Small Bushing
During break-in period (about 10 hours of use), bushing teflon moves toward cam or shaft surface. A teflon over teflon running condition occurs, leading to low friction. So it is normal to see gray teflon deposit on cam or shaft. Do not remove that deposit, it is not dust.
When a dust deposit has to be removed from the cam or the shaft, use dry cloth to avoid removing transferred teflon.

Pulley Half Cleaning
Use Pulley Flange Cleaner (P/N 413 711 809).

INSPECTION

9,10, Bushings
Check for cracks, scratch and for free movement when assembled to fixed half.
Using a dial bore gauge measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from bushing edge.
Replace bushing(s) if worn more than specified.

<table>
<thead>
<tr>
<th>DRIVEN PULLEY BUSHING WEAR LIMIT</th>
<th>mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small bushing</td>
<td>38.30  (1.508)</td>
</tr>
<tr>
<td>Large bushing</td>
<td>89.15  (3.510)</td>
</tr>
</tbody>
</table>

6, Slider Shoe
Check cam slider shoes for wear. Replace when inside edge thickness of cam slider shoe slope base is worn to 1 mm (.039 in) or less.

ASSEMBLY

6, Cam Slider Shoe
When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam. Assemble driven pulley components by reversing the disassembly procedure.

5, Cam
Coat cam interior with anti-seize lubricant.

INSTALLATION

1, Countershaft
CAUTION: Always apply anti-seize lubricant (P/N 413 701 000) on the countershaft before final pulley installation.

Should installation procedure be required, refer to BRAKE then look for Brake Disc and Countershaft Bearing Adjustment.

Reinstall the pulley on the countershaft by reversing the removal procedure.

Driven pulley end-play is 0 (zero).

12, Pulley Retaining Screw
Torque to 22 N•m (16 lbf•ft).

ADJUSTMENT

7, Spring
General
It is usual to experience spring setting during breaking period of a new spring. The factory spring preload is slightly higher (about 1 kg (2 lb)) to compensate for spring setting. Specifications in TECHNICAL DATA are applicable after break-in period (about 10 hours of use).

Spring Torsional Pre-Load
To check spring pre-load adjustment, use spring scale hook (P/N 529 006 500) and a spring scale.

Remove drive belt.

Install the hook on the sliding half. Preventing fixed half from turning, pull sliding half with the spring scale perpendicularly with pulley axle.

Take 1st measurement when sliding half begins to turn. Rotate sliding half to 10 mm (3/8 in) of rotation. Hold spring scale at this position. Slowly release tension from spring scale and take 2nd measurement when sliding half begins to return. Spring pre-load is the average measurement between these 2.

\[
\frac{1^{st \text{ measurement}}}{(\text{when opening})} + \frac{2^{nd \text{ measurement}}}{(\text{when closing})} = \text{Spring pre-load}
\]

Example:

\[
\frac{3.8 \text{ kg (8.4 lb)}}{(\text{when opening})} + \frac{3.4 \text{ kg (7.5 lb)}}{(\text{when closing})} = \frac{3.6 \text{ kg (8 lb)}}{2} = \text{Actual spring pre-load}
\]
Pulley Alignment and Drive Belt Height

Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.

Drive belt height is adjusted by turning Allen screws no. 13 equally and accordingly.

**CAUTION:** Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.

5, Cam

Make sure to install proper cam. Refer to TECHNICAL DATA.

Cam angle is identified on cam.

NOTE: For high altitude regions, a service bulletin will give information about calibration according to altitude.
REMOVAL

Remove guard and drive belt from vehicle.
Remove cap screw no. 1 and shouldered washer no. 13 then pull the driven pulley from the countershaft.
Note shouldered washer position for reinstallation.
Take care not to lose spacer no. 4.

Remove half keys no. 6 and washer no. 7 to disassemble the cam and the 2 pulley halves.

WARNING
Driven pulley cam is spring loaded, use above mentioned tool.

CLEANING

8,9, Large Bushing and Small Bushing
During break-in period (about 10 hours of use), teflon from bushing moves to cam or shaft surface. A teflon over teflon running condition occurs, leading to low friction. So it is normal to see gray teflon deposit on cam or shaft. Do not remove that deposit, it is not dust.
When a dust deposit has to be removed from the cam or the shaft, use dry cloth to avoid removing transferred teflon.

Pulley Half Cleaning
Use Pulley Flange Cleaner (P/N 413 711 809).

INSPECTION

10, Slider Shoe
Check cam slider shoes for wear. Replace when inside edge thickness of cam slider shoe slope base is worn to 1 mm (.039 in) or less.

1. Measure thickness of slope base here
2. Sliding pulley side
3. Slope base
ASSEMBLY

10, Cam Slider Shoe
When replacing slider shoes, always install a new set (3 shoes) to maintain equal pressure on the cam. Install slider shoes as per following photo. RED slider shoes are being used for reverse and BLACK ones for forward.

12, Screws
These screws are machined at there end. With the adjustment ring steel to position 0 (zero), screw ends are flush with inner side of fixed pulley half when tighten.

CAUTION: If any of these screws is not flush with inner side of sliding pulley, bushings will worn unequally.
Assemble driven pulley components by reversing the disassembly procedure.

11, Cam
Coat cam interior with anti-seize lubricant.

INSTALLATION

5, Countershaft
CAUTION: Always apply anti-seize lubricant (P/N 413 701 000) on the countershaft before final pulley installation.
Should installation procedure be required, refer to BRAKE then look for Brake Disc and Counter- shaft Bearing Adjustment.
Reinstall the pulley on the countershaft by reversing the removal procedure.

Driven pulley end-play is 0 (zero).

1, Pulley Retaining Screw
Torque to 22 N•m (16 lbf•ft).

ADJUSTMENT

Pulley Alignment and Drive Belt Height
Refer to PULLEY DISTANCE AND ALIGNMENT and DRIVE BELT to perform adjustments.
Loosen screws no. 12, turn adjustment ring no. 13 then retighten screws to adjust drive belt height.

CAUTION: Drive belt and pulley adjustments must always be checked whenever pulleys have been removed, replaced or disassembled.

11, Cam
Make sure to install proper cam. Refer to TECHNICAL DATA.
Cam angle is identified on cam.

NOTE: For high altitude regions, a service bulletin will give information about calibration according to altitude.
PULLEY DISTANCE AND ALIGNMENT

GENERAL

The pulley distance we will refer to in this section, is the space separating the drive and driven pulley outside diameters (Z measurement).

This basic distance is provided as an assembly guide and indicates the dimensions between which satisfactory belt deflection will be obtained.

Both pulley distance adjustment and pulley alignment must be carried out to ensure the highest efficiency of the transmission system. Furthermore, optimum drive belt operation and minimal wear will be obtained only with proper pulley alignment.

CAUTION: Before checking pulley adjustment, the rear suspension must be mounted on the vehicle and track tension/alignment must be done. Always check pulley adjustment after suspension is adjusted.

Failure to correctly perform pulley alignment may cause the vehicle to creep forward at idle.

All Pulley Alignment Specifications Refer to:

- X = Distance between straight bar and drive pulley fixed half edge, measured between pulleys.
- Y = Distance between straight bar and drive pulley fixed half edge, measured at the end of straight bar.
- Z = Distance between outside diameter of pulleys.

GENERAL PROCEDURE

Remove guard and drive belt.

By turning and pushing the sliding half, open the driven pulley. Insert a straight bar 9.5 mm (.375 in) square, 48 cm (19 in) long or the proper alignment bar into the opened driven pulley.

Measuring Procedure

Using Straight Bar

Always measure distances X and Y from the farther straight bar side (including its thickness to the fixed half edge).

Drive Belt Deflection

NOTE: When pulley distance and alignment are adjusted to specifications, refer to DRIVE BELT to adjust drive belt deflection.

CAUTION: This section deals mainly with adjustment procedures. For complete assembly requirements, refer to the proper ENGINE or TRANSMISSION installation section.
PULLEY ALIGNMENT AND DISTANCE SPECIFICATIONS CHART

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PULLEY DISTANCE</th>
<th>OFFSET</th>
<th>ALIGNMENT BAR P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Z ± 0.50 mm (.020 in)</td>
<td>X ± 0.50 mm (.020 in)</td>
<td>Y-X ± 0.50 mm (.020 in)</td>
</tr>
<tr>
<td>ZX 380 FAN</td>
<td>16.5 (.650)</td>
<td>35.50 (1.398)</td>
<td>1.5 (.060)</td>
</tr>
<tr>
<td>ZX LIQUID WITH FORMULA</td>
<td>16.5 (.650)</td>
<td>35.50 (1.398)</td>
<td>1.5 (.060)</td>
</tr>
<tr>
<td>ZX 500 FAN ZX LIQUID WITH HPV 27</td>
<td>16.5 (.650)</td>
<td>35.50 (1.398)</td>
<td>1.5 (.060)</td>
</tr>
</tbody>
</table>

Alignment bars have been made according to pulley alignment nominal values. However, they do not take into account allowed tolerances for alignment specifications. They are used as GO/NO GO gauges for quick alignment and pulley distance check and as templates to reach alignment nominal values.

NOTE: Prior to performing pulley adjustment, loosen torque rod nut to allow engine movement. Engine supports have tendency to stick to frame, work engine loose prior to aligning. Disconnect the tuned pipe and air intake silencer. Clean and lubricate torque rod threads.

Pulley Distance Adjustment Method

Engine Movement
The engine support has slotted mounting holes. Move engine to obtain specified distance between pulleys.
Pulley Alignment Method

Engine Movement
Loosen the 4 bolts retaining engine support to the frame. Position engine to obtain the specified alignment.

NOTE: After alignment, adjust torque rod so it slightly contacts stopper plate, then turn an additional half turn. Do not over tighten, it will disalign pulleys.

1. Half turn preload
2. Retighten
BRAKE

MECHANICAL BRAKE

Legend 380 F, MX Z 380 F and Grand Touring 380 F
HYDRAULIC BRAKE

Legend 500 F, MX Z 500 F, Summit 500 F, Grand Touring 500 F and ZX Models with 493 Engines

Legend 500 F, MX Z 500 F, Summit 500 F, Grand Touring 500 F and ZX Models with 493 Engines
ZX Liquid Cooled Models except 493 Engines

Anti-seize lubricant

37 N•m
(27 lbf•ft)

Anti-seize lubricant

Loctite 243

22 N•m
(16 lbf•ft)
BRAKE PADS REPLACEMENT

Brake pads must be replaced when lining is 1 mm (1/32 in) thick or less.

**CAUTION:** Brake pads must always be replaced in pairs.

Removal

Brake pads removal procedure is as follows:
- Remove locking tab.
- Pull out caliper from the brake disc.
- Remove 2 retainers from the pins.
- Pull out 2 pins which releases the spring.
- Remove the brake pads.

Installation

- Install new brake pads.
- Install spring and push 2 pins to lock the brake pads.
- Install 2 retainers in the pin holes.
- Install brake pad caliper on the brake disc.
- Install locking tab.

To install brake, reverse removal procedure pay attention to the following.

**WARNING**

Avoid getting oil on brake pads.
Each time a new caliper or new brake pads are installed, proceed with the following:

- With caliper not bolted to chaincase, apply brake few times until both new pads are touching each other.
- Push back pads and repeat above step.
- Push back pads then fasten caliper to chaincase.
- Proceed with bleeding as described in this subsection.

REMOVAL

BRAKE DISC REMOVAL

Models with Hydraulic Brake

Brake disc can be removed without removing chaincase. Proceed as follows:
- Remove belt guard, belt and driven pulley.
- Remove air silencer.
- Unbolt bearing support no. 4 from chassis.
- Unscrew caliper from chaincase.
- Open chaincase and remove upper sprocket.
- Pull countershaft no. 3 toward driven pulley side to free from chaincase and disc.
- Remove disc.

COUNTERSHAFT BEARING REMOVAL

Unbolt bearing support. Install screw from remover (P/N 529 035 699). Install remover (P/N 529 035 699) on countershaft for complete bearing removal.

COUNTERSHAFT REMOVAL

Models 380 F, 500 F and 500 LC

- Remove caliper.
- Remove guard, belt and driven pulley.
- Remove air silencer.
- Unbolt bearing support no. 19 from chassis.
- Open chaincase and remove upper sprocket.
- Pull countershaft assembly toward driven pulley side to gain access to clip no. 25.
- Remove clip no. 25 on countershaft.
DISASSEMBLY
7,15,16,23. Brake Pad, Brake Lever, Pin and Screw

**Models with Mechanical Brake**
Pull pin out of caliper and remove lever.
Fixed pad is riveted to chaincase on these models. Caliper must be split to remove moving pad. To removed fixed pad, drill out its rivet then pry disc in order to free fixed pad.

**Models with Hydraulic Brake**
Only brake pads are available as spare parts. If caliper or master cylinder are damaged, replace each of them as an assembly.

CLEANING
Clean all metal components in a general purpose solvent. Thoroughly dry all components before assembling.
**CAUTION:** Do not clean brake pads in solvent. Soiled brake pads must be replaced by new ones.

INSPECTION
7, Brake Pad

**Models with Mechanical Brake**
Brake pads must be replaced when fixed pad projects only 1 mm (1/32 in) from caliper.

**CAUTION:** Brake pads must always be replaced in pairs.

---

TYPICAL
1. Fixed pad
2. Inner caliper
A. 1 mm (1/32 in) minimum

**Models with Hydraulic Brake**
Brake pads must be replaced when lining is 1 mm (1/32 in) thick or less. Refer to the photo in BRAKE PADS REPLACEMENT.

17, Brake Disc
Check for scoring, cracking or bending, replace as required.
**CAUTION:** Brake disc should never be machined.

ASSEMBLY

**Models with Mechanical Brake**
14, Ratchet Wheel
Apply synthetic grease (P/N 413 711 500) on threads and spring seat prior to installing. Fully tighten then back off one turn.

16, Pin
Install so that it can only be removed upward. Lock it in the caliper casting notch.
INSTALLATION

17, Brake Disc

*Models with Mechanical Brake*

The brake disc must be floating on countershaft for efficient operation of brake.

Apply anti-seize lubricant (P/N 293 800 070) on shaft and check that disc slides freely.

The disc hub exceeds the disc more from one side than from the other. Install disc with the longer exceeding portion toward driven pulley.

Push O-rings inside disc hub.

*Models with Hydraulic Brake*

Apply anti-seize lubricant (P/N 293 800 070) on shaft.

The disc hub exceeds the disc more from one side than from the other. Install disc with the longer exceeding portion toward driven pulley.

7, Brake Pad

*Models with Hydraulic Brake*

After brake pads installation, brake disc must be centered in caliper. Apply brake then check for proper brake disc positioning.

Push on appropriate caliper piston in order to move pad inward allowing proper brake disc positioning.

Countershaft Bearing Adjustment

Insert countershaft (with brake disc) from chaincase side through countershaft support (driven pulley side), then insert into chaincase.

Install countershaft bearing no. 19 using proper tool.

To install bearing on countershaft, use remover (P/N 529 030 100) and some flat washers of 3 mm (1/8 in) total thickness. Using original retaining screw and shouldered washer tighten until bearing rests against circlip.

Ensure that countershaft is properly aligned, then tighten 3 retaining screws.

**NOTE:** A misaligned countershaft will result in difficulty to center the bearing in its support.

Torque castellated nut of upper sprocket to 45 to 75 N·m (33 to 55 lbf·ft).

Close chaincase referring to CHAINCASE.

1,11,12, Locking Tab, Outer Caliper and Nut

Install caliper retaining bolts.

Assemble outer caliper. Install locking tab then nuts. Torque nuts to 24 N·m (18 lbf·ft). Bend locking tab over a flat of each nut.
5,12, Brake Cable and Nut
Insert brake cable into upper hole in brake lever and caliper. Install nut and tighten until a few threads exceed.

\[ \text{WARNING} \]
At least 3 threads must exceed the elastic stop nut.

10, Upper Clamp
Install upper clamp with its arrow pointing at front of vehicle. Tighten to 8 N\(\times\)m (71 lbf\(\times\)in) front screw before rear one.

\[ \text{TYPICAL} \]
1. Arrow on upper clamp pointing at front of vehicle
2. Tighten front screw first

ADJUSTMENT
Brake
Models with Mechanical Brake
Fully depress brake handle several times to obtain 13 mm (1/2 in) between brake handle and handlebar grip when brake is fully applied.

Should this adjustment be unattainable, retighten nut no. 12 as needed.

Models with Hydraulic Brake
Change brake fluid once a year.
Bleed brake system as follows:
Keep sufficient DOT 4 brake fluid in reservoir at all times.

CAUTION: Use only DOT 4 brake fluid.
Install a hose on left side bleeder. Route this hose to a container. Open bleeder.
Pump brake lever until no air escapes from hose. Close bleeder.
Proceed the same way with the right side bleeder.

\[ \text{TYPICAL} \]
1. Open bleeder
2. Clear hose to catch used brake fluid

5, Brake Light Switch
Models with Mechanical Brake
Brake light should light up before brake pads touch brake disc. To adjust, unscrew nut no. 12 until brake light goes on.

\[ \text{WARNING} \]
At least 3 full threads must exceed the elastic stop nut.

Check brake adjustment as described above.

NOTE: If brake light adjustment is unattainable while respecting brake adjustment, ratchet wheel may be too far out. If so, tighten ratchet wheel.

Models with Hydraulic Brake
There is no adjustment on these models. Check that switch is securely installed.
BLEEDING

Change brake fluid once a year.
Bleed brake system as follows:
Keep sufficient DOT 4 brake fluid in reservoir at all times.

**CAUTION:** Use only DOT 4 brake fluid.

Install a clear hose on left side bleeder. Route this hose to a container. Open bleeder.
Pump brake lever until no air escapes from hose.
Close bleeder.
Proceed the same way with the right side bleeder.

![Diagram](image.png)

**TYPICAL**
1. Open bleeder
2. Clear hose to catch used brake fluid

**WARNING**
Avoid getting oil on brake pads. Do not lubricate or apply antirust or antifreeze solution in brake cable.
REMOVAL AND DISASSEMBLY

To remove chaincase proceed as follows.

Remove tuned pipes and muffler.

WARNING

Never remove exhaust components when engine is hot.

Remove hair pin no. 8. Release drive chain tension by unscrewing tensioner adjustment screw. Drain oil by removing drain plug no. 24.

3,4,5,6,13,16,17, Cotter Pin, Nut, Sprocket, Shim and Drive Chain

Apply parking brake.

Remove cotter pin no. 3 and nut no. 4 retaining upper sprocket no. 5 and screw no. 15 retaining lower sprocket no. 16. Pull sprockets and drive chain simultaneously. Remove shims nos. 6 and 17.

NOTE: Should countershaft removal be required, refer to BRAKE then look for Countershaft Removal.

Release parking brake.

Remove 3 nuts no. 14.

Unfold locking tab no. 23 then remove caliper retaining screws no. 22.

Release track tension, use drive axle holder no. 20 (P/N 529 007 200).

Pry out drive axle oil seal no. 19 from chaincase. Pull chaincase from drive axle and countershaft. Using 2 large prybars inserted between chaincase housing no. 7 and frame, pry complete assembly from vehicle.

CHAINCASE HOUSING REMOVAL

INSPECTION

Visually inspect the chain for cracked, damaged or missing links. Check for worn or defective bearings, sprockets and chain tensioner components.

WARNING

If chain deflection is greater than 38 mm (1.5 in) (without chain tensioner), replace chain and check condition of sprockets.

GEAR RATIO MODIFICATION

For particular applications, the number of teeth of the sprockets can be increased or decreased on lower and upper sprockets.

Refer to TECHNICAL DATA for gear ratios.

CAUTION: Gear ratio modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance.

NOTE: For high altitude regions, a service bulletin will give information about calibration according to altitude.
INSTALLATION AND ASSEMBLY

Reverse removal and disassembly procedure and pay attention to the following. Replace oil seals, gaskets O-rings and drain plug.

25, Hardened Washer

*793 Engine Equipped Models Only*

Make sure to install a hardened washer on each end of spring.

1. Hardened washers

**All Models**

11, Oil Seal

Using an appropriate pusher, press the oil seal into chaincase hub. Oil seal must fit flush with the chaincase edge.

**NOTE:** Should installation procedure for counter-shaft be required, refer to BRAKE.

5,16, Sprockets

Position the sprockets with the writing facing the chaincase cover. Sprocket hub faces toward chaincase.

4, Upper Sprocket Castellated Nut

Torque to 45 to 75 N•m (33 to 55 lbf•ft). Install new cotter pin in the position shown.

**CAUTION:** When removing a cotter pin always replace with a new one.

**CAUTION:** Cotter pin will rub on chaincase cover if installed otherwise.

18, Circlip

**CAUTION:** It is of the utmost importance to install the circlip otherwise damage to the chaincase components may occur.

**DRIVE CHAIN ADJUSTMENT**

**NOTE:** Brake disc key must be in good condition before checking chain free play.

10, O-Ring

Replace O-ring no. 10 on tensioner adjustment screw. Fully tighten tensioner adjustment screw **by hand**, then back off only far enough for hair pin to engage in locking hole.

This initial adjustment should provide 3 - 5 mm (1/8 - 13/64 in) free-play when measured at the outer circumference of the brake disc.

**CAUTION:** Free-play must not exceed 5 mm (13/64 in), readjust if necessary.

**WARNING**

If the specified free-play is not reached with the tensioner screw fully tightened, replace chain and check the condition of sprockets.
21, Chaincase Oil
Pour 250 mL (8.5 U.S. oz) of synthetic chaincase oil (P/N 413 803 300) into chaincase.

**NOTE:** Chaincase oil capacity is 250 mL (8.5 U.S. oz).
Check oil level with the dipstick then add if required. Remove metal particles from magnet.

**TYPICAL**
1. Dipstick  
2. Oil level  
3. Level between marks  
4. Magnet

**NOTE:** Chaincase must be in its proper position when checking oil level.

**ADJUSTMENT**

**Pulley Alignment**
Refer to PULLEY DISTANCE AND ALIGNMENT.

**Track Tension and Alignment**
Refer to TRACK.
DRIVE CHAIN

SILENT CHAIN

There are 2 types of silent chains. One is 11-plates wide and the other is 13-plates wide (stronger). Do not interchange chains. Fit chain on top sprocket to make sure that you are using right one according to width. Refer to TECHNICAL DATA.

NOTE: No work (separation, lengthening) can be done on the silent chain type.