# CHAPTER 6

# Final Drive and Brakes

## GEAR RATIO SPEED CHARTS

### 8.373 CD Chaincase Speed Chart

| Top Gear | 26 | 26 | 25 | 25 | 25 | 25 | 25 | 24 | 24 | 23 | 23 | 22 | 22 | 22 | 21 | 21 | 21 | 20 | 20 | 19 | 19 | 19 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bottom Gear | 36 | 40 | 36 | 37 | 40 | 41 | 44 | 41 | 42 | 39 | 42 | 39 | 40 | 43 | 40 | 41 | 44 | 41 | 45 | 38 | 41 | 42 | 46 |
| Chain | 76 | 78 | 76 | 76 | 78 | 78 | 80 | 78 | 78 | 76 | 78 | 76 | 76 | 78 | 76 | 76 | 78 | 76 | 78 | 74 | 76 | 76 | 78 |
| Gear Ratio | 1.38 | 1.54 | 1.44 | 1.48 | 1.60 | 1.64 | 1.76 | 1.71 | 1.75 | 1.70 | 1.83 | 1.77 | 1.82 | 1.95 | 1.90 | 1.95 | 2.10 | 2.05 | 2.25 | 2.00 | 2.16 | 2.21 | 2.42 |
| Jackshaft RPM | MPH at 1 : 1 Clutch Ratio | | | | | | | | | | | | | | | | | | | | | | |
| 6000 | 93 | 84 | 89 | 87 | 81 | 79 | 73 | 75 | 74 | 76 | 71 | 73 | 71 | 66 | 68 | 66 | 62 | 63 | 57 | 64 | 60 | 58 | 53 |
| 6250 | 97 | 87 | 93 | 91 | 84 | 82 | 76 | 79 | 77 | 79 | 74 | 76 | 74 | 69 | 70 | 69 | 64 | 65 | 60 | 67 | 62 | 61 | 55 |
| 6500 | 101 | 91 | 97 | 94 | 87 | 85 | 79 | 82 | 80 | 82 | 76 | 79 | 77 | 71 | 73 | 72 | 67 | 68 | 62 | 70 | 65 | 63 | 58 |
| 6750 | 105 | 94 | 101 | 98 | 91 | 88 | 82 | 85 | 83 | 85 | 79 | 82 | 80 | 74 | 76 | 74 | 69 | 71 | 64 | 72 | 67 | 66 | 60 |
| 7000 | 109 | 98 | 104 | 102 | 94 | 92 | 85 | 88 | 86 | 89 | 82 | 85 | 83 | 77 | 79 | 77 | 72 | 73 | 67 | 75 | 70 | 68 | 62 |
| 7250 | 112 | 101 | 108 | 105 | 97 | 95 | 88 | 91 | 89 | 92 | 85 | 88 | 86 | 80 | 82 | 80 | 74 | 76 | 69 | 78 | 72 | 70 | 64 |
| 7500 | 116 | 105 | 112 | 109 | 101 | 98 | 92 | 94 | 92 | 95 | 88 | 91 | 89 | 82 | 85 | 83 | 77 | 79 | 72 | 81 | 75 | 73 | 67 |
| 7750 | 120 | 108 | 116 | 112 | 104 | 101 | 95 | 97 | 95 | 98 | 91 | 94 | 92 | 85 | 87 | 85 | 79 | 81 | 74 | 83 | 77 | 75 | 69 |
| 8000 | 124 | 112 | 119 | 116 | 107 | 105 | 98 | 101 | 98 | 101 | 94 | 97 | 95 | 88 | 90 | 88 | 82 | 84 | 76 | 86 | 80 | 78 | 71 |
| 8250 | 128 | 115 | 123 | 120 | 111 | 108 | 101 | 104 | 101 | 104 | 97 | 100 | 97 | 91 | 93 | 91 | 85 | 86 | 79 | 89 | 82 | 80 | 73 |
| 8500 | 132 | 119 | 127 | 123 | 114 | 111 | 104 | 107 | 104 | 108 | 100 | 103 | 100 | 93 | 96 | 94 | 87 | 89 | 81 | 91 | 85 | 83 | 75 |
| 8750 | 136 | 122 | 131 | 127 | 117 | 115 | 107 | 110 | 107 | 111 | 103 | 106 | 103 | 96 | 99 | 96 | 90 | 92 | 84 | 94 | 87 | 85 | 78 |
| 9000 | 140 | 126 | 134 | 131 | 121 | 118 | 110 | 113 | 110 | 114 | 106 | 109 | 106 | 99 | 101 | 99 | 92 | 94 | 86 | 97 | 90 | 87 | 80 |
| 9250 | 143 | 129 | 138 | 134 | 124 | 121 | 113 | 116 | 114 | 117 | 109 | 112 | 109 | 102 | 104 | 102 | 95 | 97 | 88 | 99 | 92 | 90 | 82 |
| 9500 | 147 | 133 | 142 | 138 | 128 | 124 | 116 | 119 | 117 | 120 | 112 | 115 | 112 | 104 | 107 | 105 | 97 | 100 | 91 | 102 | 95 | 92 | 84 |
| 9750 | 151 | 136 | 145 | 141 | 131 | 128 | 119 | 123 | 120 | 123 | 115 | 118 | 115 | 107 | 110 | 107 | 100 | 102 | 93 | 105 | 97 | 95 | 86 |
| 10,000 | 155 | 140 | 149 | 145 | 134 | 131 | 122 | 126 | 123 | 127 | 118 | 121 | 118 | 110 | 113 | 110 | 103 | 105 | 95 | 107 | 100 | 97 | 89 |

## DRIVE GEARS AND CHAINS

### Drive Gears

| PART NUMBER | DESCRIPTION |
|---|---|
| 3221093 | 17T, 3/4W, 15 SPL, HYVO, PM |
| 3221094 | 18T, 3/4W, 15 SPL, HYVO, PM |
| 3221095 | 19T, 3/4W, 15 SPL, HYVO, PM |
| 3221096 | 20T, 3/4W, 15 SPL, HYVO, PM |
| 3221097 | 21T, 3/4W, 15 SPL, HYVO, PM |
| 3221098 | 22T, 3/4W, 15 SPL, HYVO, PM |
| 3221099 | 23T, 3/4W, 15 SPL, HYVO, PM |
| 3221101 | 24T, 3/4W, 15 SPL, HYVO, PM |
| 3221102 | 25T, 3/4W, 15 SPL, HYVO, PM |
| 3222127 | 26T, 3/4W, 15 SPL, HYVO, PM |
| 3222126 | 36T, 3/4W, 15 SPL, HYVO, PM |
| 3222125 | 37T, 3/4W, 15 SPL, HYVO PM |
| 3222108 | 39T, 3/4W, 15 SPL, HYVO, PM |
| 3222099 | 40T, 3/4W, 15 SPL, HYVO, PM |
| 3222101 | 41T, 3/4W, 15 SPL, HYVO, PM |
| 3221188 | 43T, 3/4W, 15 SPL, HYVO, PM |

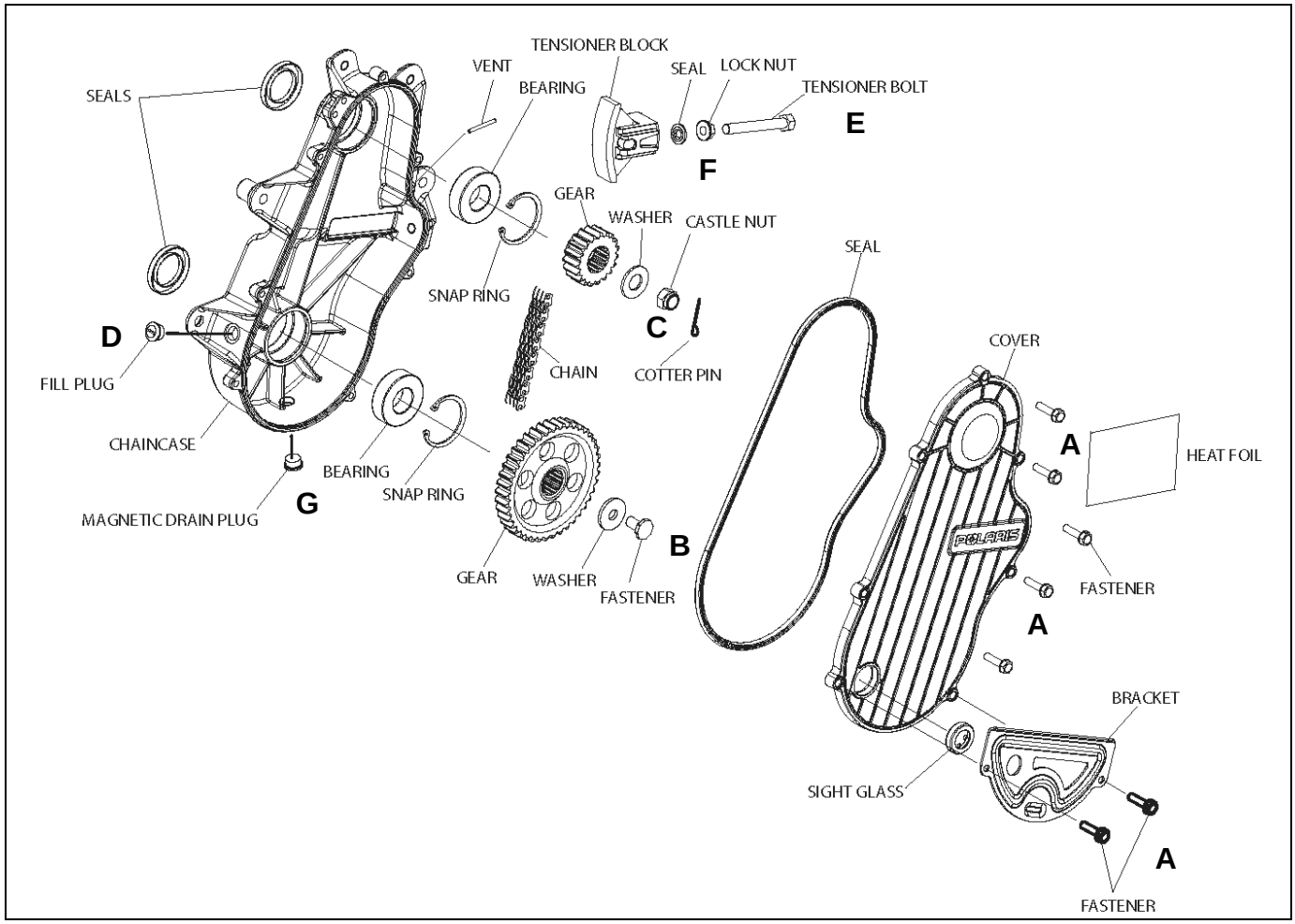
**CM** = Cut Metal Sprocket **PM** = Powder Metal Sprocket

### Drive Chains

| PART NUMBER | DESCRIPTION |
|---|---|
| 3221109 | 74P, 3/4W, HYVO CHAIN |
| 3221108 | 76P, 3/4W, HYVO CHAIN |
| 3222110 | 78P, 3/4W, HYVO CHAIN |

## 8.373 CHAINCASE

### Assembly View




| = T |
|---|
| A = Cover Fasteners = 10 Ft.Lbs. (12 Nm)<br>B = Lower Gear Fastener = 19 Ft.Lbs. (26 Nm)<br>C = Upper Gear Castle Nut = 50 Ft.Lbs. (62 Nm)<br>D = Fill Plug = 18 - 25 In.Lbs.<br>E = Tensioner Bolt = Hand Tight<br>F = Tensioner Lock Nut = 21 Ft.Lbs. (28 Nm)<br>G = Drain Plug = 8 Ft.Lbs. (11 Nm) |

**WARNING**

Incorrect chain tension may cause the chain to break which may result in the loss of braking control.

**CAUTION**

Never re-use Cotter pins. Always replace with new parts.
Incorrect chain tension may cause the chain to break, causing severe chaincase damage.

Installing gear sets not listed on the Gear Ratio Speed chart may cause premature gear / chain wear.

**NOTE: Verify tensioner bolt seal is flush with mating surface prior to securing lock nut.**
**Maintain gear oil level at mid-point of sight glass with vehicle on level ground.**
**Install lower gear washer with beveled side out.**
**Some models feature a magnesium cover. Magnesium covers do not feature a bracket. Magnesium covers cannot be installed on 2006 - 2008 chain cases.**

## Chaincase Disassembly

1. Position the vehicle on level ground. Drain the oil out of the chaincase into a suitable container. Replace the drain plug.
2. Remove the right-side door panel, and exhaust silencer.
3. Remove the chaincase cover. Un-screw the chain tensioner bolt.
4. Remove the cotter pin from the upper gear castle nut and discard. Lock the parking brake, then remove the castle nut.
5. Remove the lower gear fastener and washer. Note that beveled side of the washer faces out.
6. Remove the chain and upper / lower gears from the chaincase.
7. Remove the brake caliper from the chaincase. Secure the caliper up and away from the chaincase.

**⚠ CAUTION**

Do not kink or bend the brake hose.

8. Remove the drive belt from the clutches. Remove the driven clutch.
9. Raise the rear of the vehicle on a track stand. Loosen the rear idler wheels and track tension adjusters. Slide the rear idler shaft completely forward.
10. Remove the speedometer flange / housing from the bulkhead.
11. Slide the driveshaft out of the chaincase towards the clutch-side of the vehicle.

**NOTE: On some models, it may be necessary to remove the left-side console storage bucket.**

12. Remove the nuts securing the chaincase to the frame. Carefully pull the chaincase away from the jackshaft, then out of the engine compartment.
13. To replace the seals and bearings, carefully pry out the seals from the backside of the chaincase and discard.
14. Remove the two snap rings securing the bearings inside the case.
15. Press on the outer race of each bearing from the backside of the case to remove each bearing.

**⚠ CAUTION**

Always press on the outer race of the bearings.

16. To install the bearing, press on the bearing outer race from the inside of the cover until fully seated. Install the snap ring making sure it is seated in the groove.
17. Lightly coat the outer edge of each new seal with oil, then install with the seal lips facing each bearing from the backside of the case.
18. Inspect the jackshaft seal sleeve for abnormal wear and tear. Replace the o ring with a new part.

## Chaincase Assembly

1. Install a the jackshaft seal sleeve and a new o ring on the jackshaft.
2. Install the jackshaft installation tool, PN 2871296, on to the end of the jackshaft, or wrap electrical tape over the jackshaft splines.
3. Carefully re-install the chaincase. Install the chaincase fasteners and nuts. Hand-tighten the nuts so that the chaincase can still be moved.
4. Install the driveshaft back into the chaincase.
5. Remove the jackshaft installation tool from the jackshaft, then install the jackshaft alignment tool, PN 2871535, on to the jackshaft.
6. Torque all of the chaincase fasteners to specification using a criss-cross pattern.

**= T**

Chaincase Mounting Fasteners
28 Ft.Lbs. (38 Nm)
DO NOT OVER-TORQUE FASTENERS

7. Remove the jackshaft alignment tool. Install the brake caliper and torque fasteners to specification.

**= T**

Brake Caliper Mounting Fasteners
19 - 21 Ft.Lbs. (26 - 28 Nm)

8. Torque speedometer / driveshaft flange nuts and torque to specification.

**= T**

Speedometer / Driveshaft Nuts
17 Ft.Lbs. (23 Nm)

9. Torque speedometer housing nuts to specification.
10. Lock the parking brake.

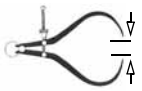
**= T**

Speedometer Housing Nuts
17 Ft.Lbs. (23 Nm)

11. Reinstall the chain and upper / lower gears. Install the lower gear washer with the beveled side facing out. Torque castle nut and lower gear fastener to specifications.

| = T |
|---|
| Upper Gear Castle Nut<br>50 Ft.Lbs. (68 Nm)<br>(Do not back nut off only to align cotter pin holes with nut.)<br>Lower Gear Fastener<br>19 Ft.Lbs. (26 Nm) |

12. Turn the chain tensioner bolt in until there is 0.25 in. (6.35mm) deflection between the backside of the chain and the chaincase.

|  = In. / mm. |
|---|
| Drive Chain Deflection<br>0.25in. (6.35mm) |

13. Turn the tensioner bolt seal down into the chaincase. Torque the tensioner bolt jam nut to specification.

| = T |
|---|
| Tensioner Jam Nut<br>21 Ft.lbs. (28 Nm) |

14. Verify the cover seal is in good condition. Install the cover and bracket. Torque fasteners to specification using a criss-cross pattern.

| = T |
|---|
| Chaincase Cover Fasteners<br>10 Ft.Lbs. (13 Nm) |

15. Fill the chaincase with new chaincase oil until the level is at the mid point of the sight glass.

### Chaincase Oil

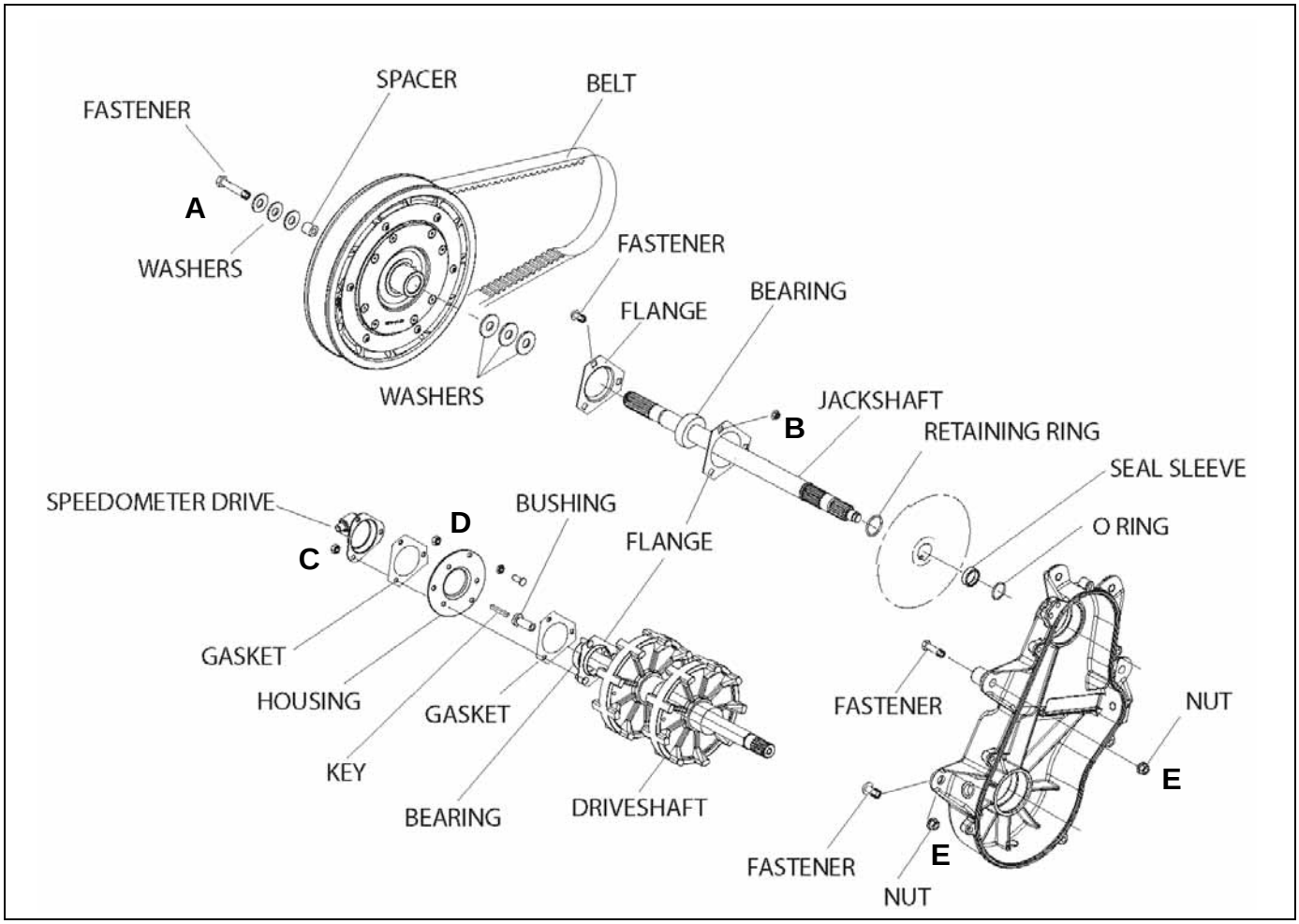
| Polaris 80W Synthetic Chaincase Lubricant |
|---|

|  |
|---|
| Chaincase Fluid Capacity = 11oz. (325.3 ml) |

16. Reinstall the exhaust silencer and door panel.
17. Reference the PVT System and Front and Rear Suspensions chapters for idler shaft torque and PVT system assembly information.

## DRIVE TRAIN

### Speedometer Cable Type Drive Train Assembly




| = T |
|---|
| A = Driven Clutch Fastener = 17 Ft.Lbs. (23 Nm)<br>B = Jackshaft Flange Nuts = 17 Ft.Lbs. (23 Nm)<br>C = Speedometer Housing Nuts = 17 Ft.Lbs. (23 Nm)<br>D = Driveshaft Housing Nuts = 17 Ft.Lbs. (23 Nm)<br>E = Chaincase Mounting Nuts = 28 Ft.Lbs. (38 Nm) |

| CAUTION |
|---|
| Do not over-torque the chaincase mounting nuts. |

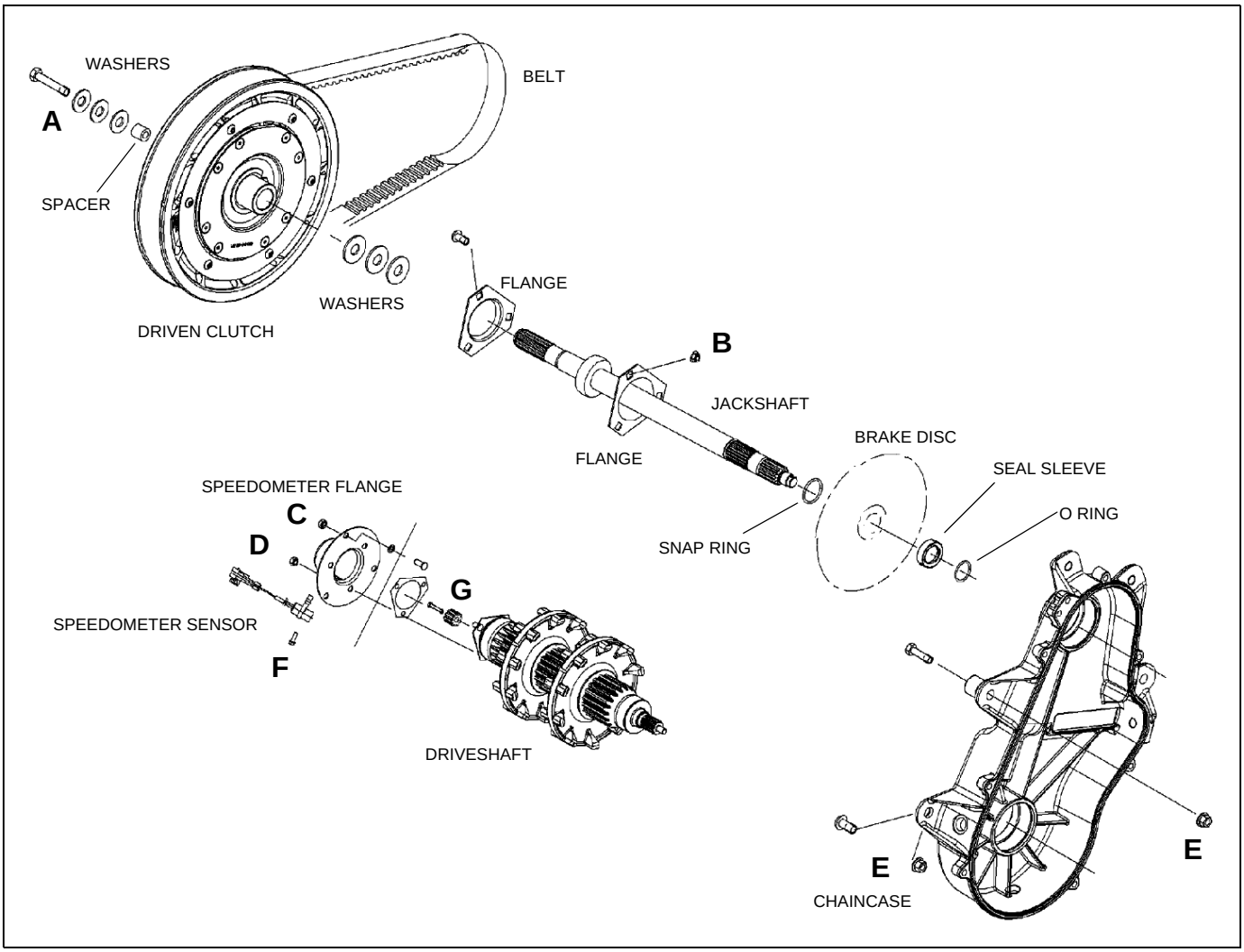
**NOTE: Set driven clutch offset following procedure in the PVT System Chapter.**

**Lubricate components as outlined in the Periodic Maintenance Table.**

**Tighten chaincase mounting nuts using a criss-cross pattern.**

**Install jackshaft seal sleeve with beveled edge towards brake disc, then install o ring inside sleeve.**

## Electronic Speedometer Drive Train Assembly




| = T |
|---|
| A = Driven Clutch Fastener = 17 Ft.Lbs. (23 Nm) |
| B = Jackshaft Flange Nuts = 17 Ft.Lbs. (23 Nm) |
| C = Speedometer Housing Nuts = 17 Ft.Lbs. (23 Nm) |
| D = Driveshaft Housing Nuts = 17 Ft.Lbs. (23 Nm) |
| E = Chaincase Mounting Nuts = 28 Ft.Lbs. (38 Nm) |
| F = Speedometer Sensor Screw = 5 Ft.Lbs. (7 Nm) |
| G = Speedometer Gear Screw = 15 Ft.Lbs. (11 Nm) |

| CAUTION |
|---|
| Do not over-torque the chaincase mounting nuts. |

**NOTE: Set driven clutch offset following procedure in the PVT System Chapter.**

**Lubricate components as outlined in the Periodic Maintenance Table.**

**Tighten chaincase mounting nuts using a criss-cross pattern.**

**Install jackshaft seal sleeve with beveled edge towards brake disc, then install o-ring inside sleeve.**

## Jackshaft Removal

1. Remove the drive belt, and driven clutch.
2. Note of the number and location of the driven clutch spacers/washers.
3. Drain the chaincase lubricant.
4. Remove the chaincase cover.
5. Remove the cotter pin on the upper sprocket.
6. Apply parking brake.
7. Remove the upper sprocket nut.
8. Remove the lower sprocket retaining bolt.
9. Loosen the chain tensioner.
10. Remove the upper and lower sprockets and chain from chaincase.
11. Release the parking brake.
12. Remove the bearing flange on the driven clutch side.
13. Remove the jackshaft assembly from the brake disc and chassis by tapping on the end of the jackshaft with a soft face hammer.
14. This will also remove the o-ring and seal.
15. Inspect jackshaft in bearing contact area. If diameter is 0.001" (.025 mm) less than non-contact area, replace the jackshaft.

## Jackshaft Installation

1. Install jackshaft installation tool PN 2871296 onto the threads of the jackshaft.
2. Insert the jackshaft assembly through the brake disc. and install a new o-ring and seal sleeve. Push jackshaft through chaincase.
3. Remove the jackshaft installation tool.
4. With the jackshaft through the chaincase, install the jackshaft alignment tool PN 2871535 and secure with the flat washer and castle nut.
5. Tighten the castle nut securely to ensure positive bearing and jackshaft seating to chaincase.
6. If shaft is not centered, tap shaft with a soft faced hammer until centered. This will align the upper chaincase bearing in the chaincase bore.
7. Once the correct jackshaft alignment has been achieved, install lock nuts on the chaincase mounting bolts and torque them to 20 ft-lb (27 N-m).
8. Remove the jackshaft alignment tool from chaincase.
9. Install jackshaft flangette and bolts. Align grease hole in bearing with hole or fitting in flangette. Torque nuts to 11 ft-lb (15 N-m).
10. Place the same amount of washers on the drive clutch end of the jackshaft.
11. Install the driven clutch, spacer, and washers and torque the retaining bolt to 17 ft-lb (23 N-m).
12. Install the belt.

## Driveshaft Removal/Installation

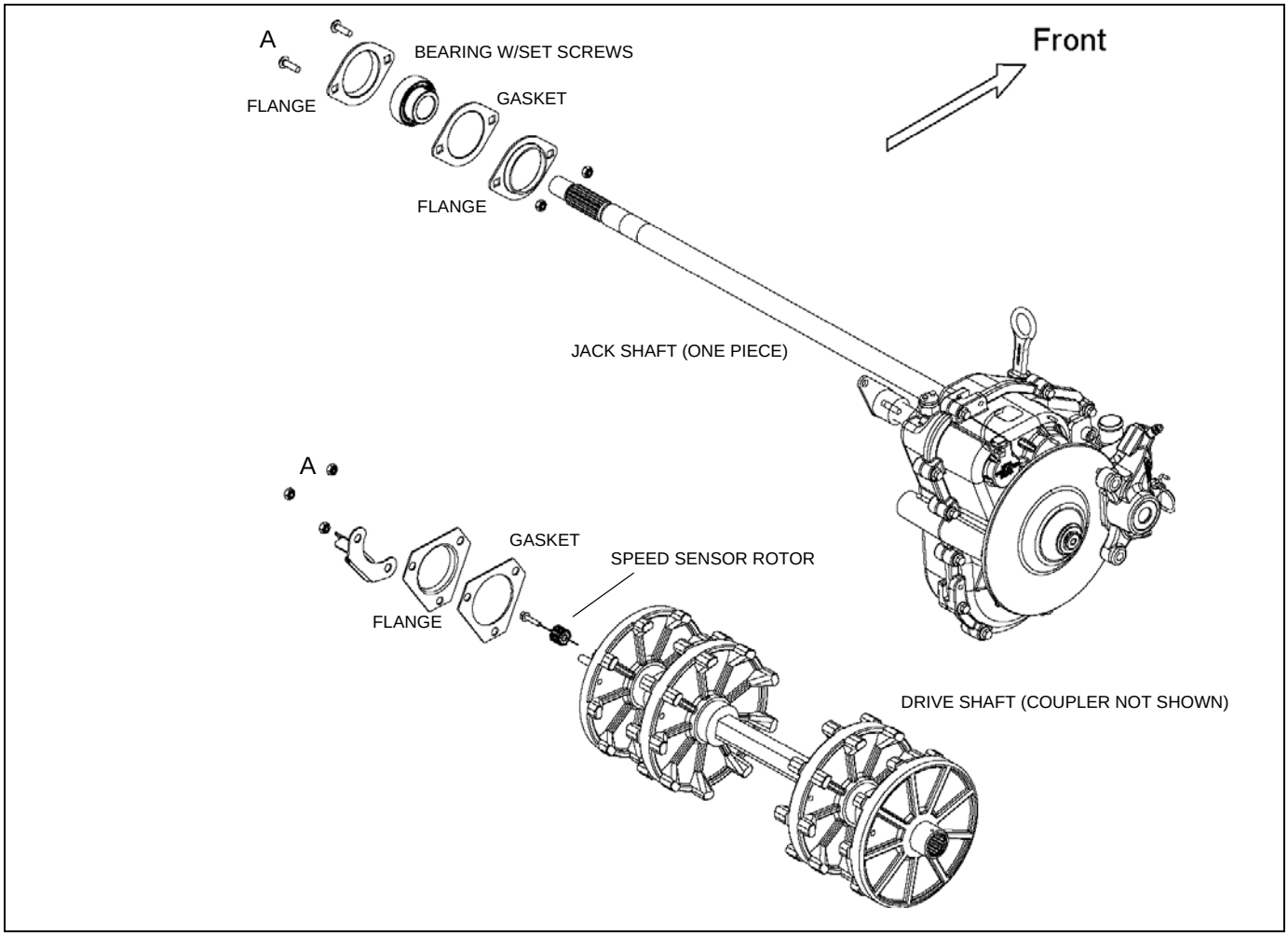
1. Remove the side panels.
2. Remove the intake plenum.
3. Remove the drain plug and drain the chaincase fluid.
4. Replace the chaincase drain plug and torque it to 8 ft-lb (11 N-m).

| = T |
| --- |
| Drain Plug: 8 ft-lb (11 N-m) |

5. Remove the chaincase cover.
6. Loosen the tensioner.
7. Remove the lower sprocket bolt and washer.
8. Shut off the fuel valve if so equipped.
9. Remove the exhaust system.
10. Remove the speedometer drive pickup.
11. Remove the speedo drive housing.
12. Remove the rear skid.
13. With the sled over on its left side and the rear skid removed, remove the drive shaft.
14. Assemble in reverse order

## IQ WIDETRAK GEAR CASE

### Driveshaft and Jackshaft




| = T |
|---|
| A = 35 Ft.Lb. (47 Nm) |

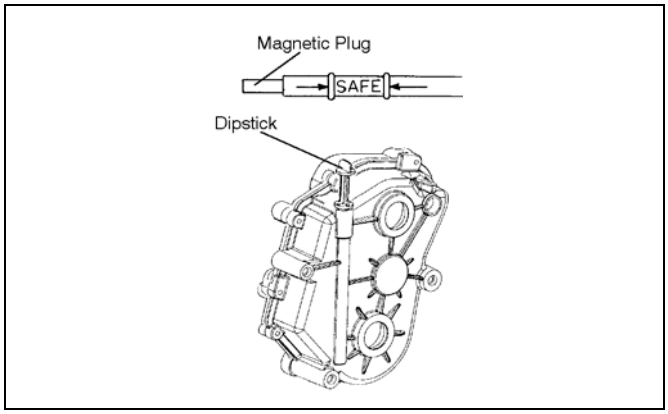
**NOTE: The jackshaft cannot be removed from the gear case without gear case disassembly.**

**Lubricate the jackshaft bearing using a grease gun needle attachment.**

## Gearcase Oil Level Check

### Gearcase Oil

| Polaris 80W Synthetic Chaincase Lubricant |
|---|




1. Position the vehicle on a flat, level surface.
2. Remove the dipstick and wipe clean. Reinstall the dipstick.
3. Remove the dipstick and verify oil level. Add recommended oil at the dipstick hole if needed. Do not overfill.

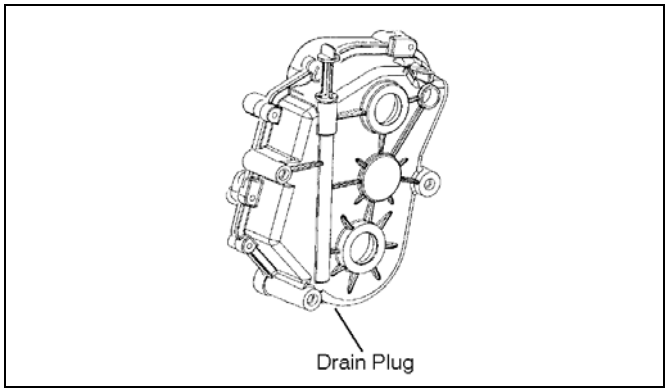
**NOTE: Always clean the magnetic plug when dipstick is removed and at 500 mile intervals.**

## Gearcase Oil Change

### Gearcase Oil

| Polaris 80W Synthetic Chaincase Lubricant |
|---|

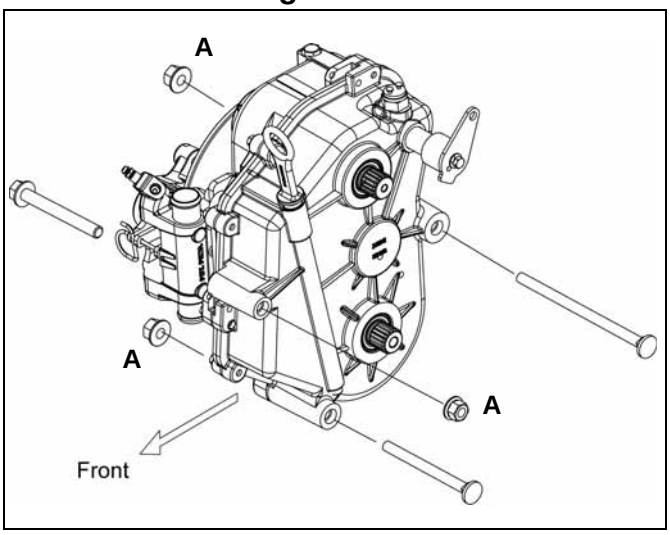
| = |
|---|
| Gearcase Fluid Capacity = 20 oz. |




1. Position the vehicle on a flat, level surface.
2. Position a drain pan under the gearcase. Remove any dirt from the Allen head drain plug.
3. Remove the drain plug with a 3/16 Allen wrench. Drain all of the oil into the drain pan. Dispose of the used oil appropriately.
4. Reinstall the drain plug. Torque plug to 6 - 10 Ft.Lbs. (8 - 13 Nm).
5. Remove the dipstick and fill the gearcase with new oil. Do not overfill.

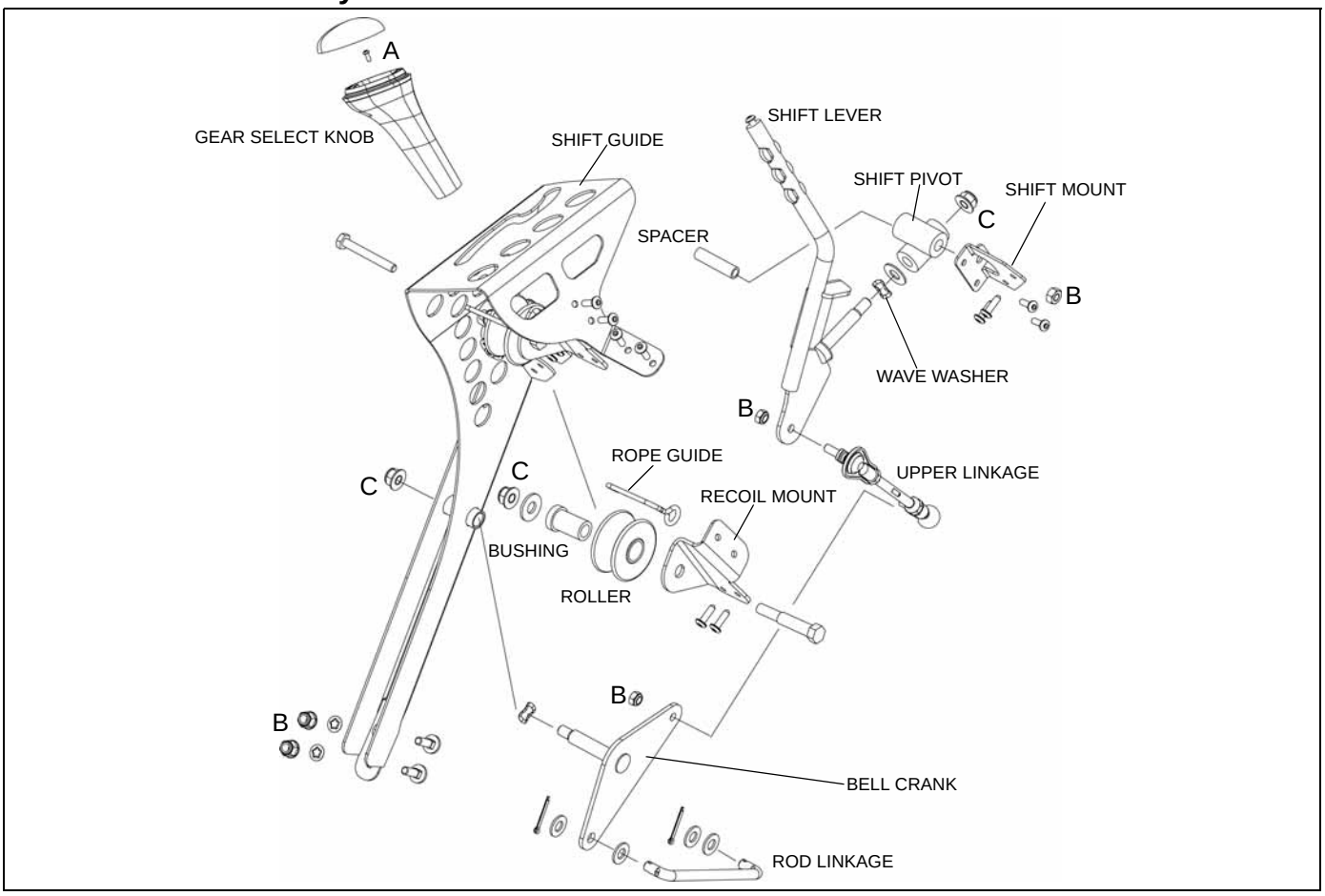
**NOTE: Always clean the magnetic plug when dipstick is removed and at 500 mile intervals.**

## Gearcase Mounting



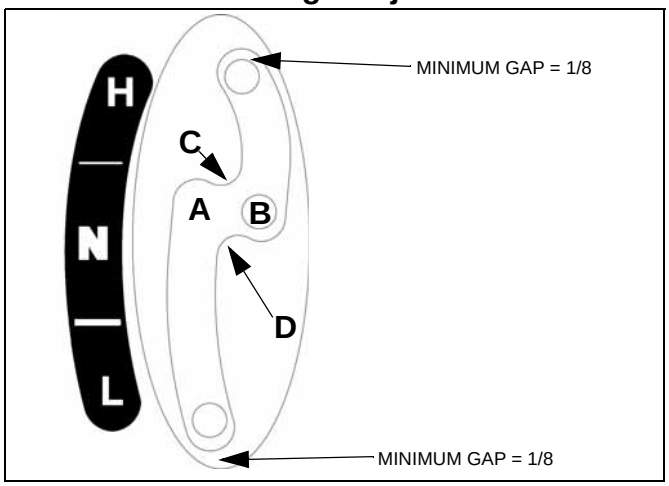

| = T |
|---|
| A = 28 Ft.lbs.(38Nm) |

## Gear Selector Assembly




| = T |
|---|
| A = 5 Ft.Lbs. (7 Nm)<br>B = 7 Ft.Lbs. (9.5 Nm)<br>C = 15 Ft.Lbs. (20 Nm) |

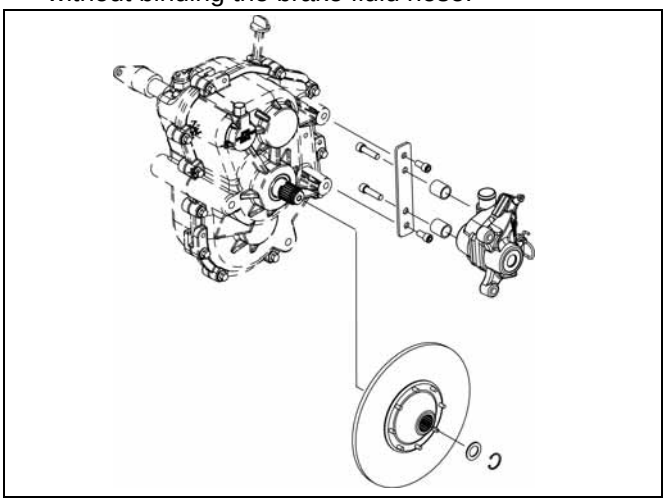
## Gear Selector Linkage Adjustment



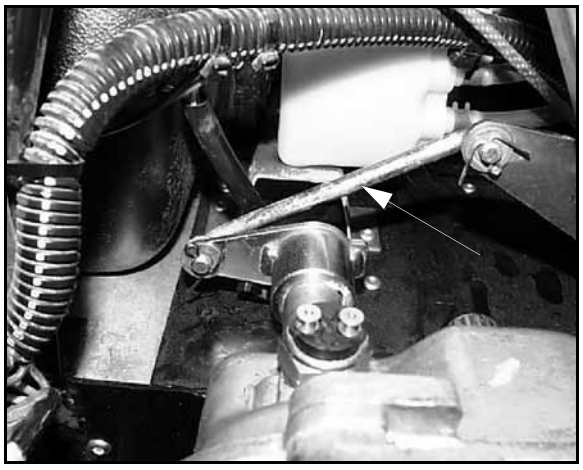

1. Adjust length of upper linkage so shift lever can move freely from point (A) to point (B) without contacting points (C) or (D).
2. There should be a minimum 1/8 gap between the shift lever and shift slot when shifted into high or low gear.
3. Torque linkage jam nuts to 8 - 14 ft.lbs.(11 - 19 Nm) when adjustment is correct.

## Gear Case Removal

1. Open the hood and remove the engine compartment doors.
2. Remove exhaust resonator.
3. Remove the brake caliper from the gearcase cover. Secure the caliper up and away from gearcase without binding the brake fluid hose.



4. Note location of shift linkage on transmission to assure proper location during reassembly. Remove cotter pin, washers, and pin from transmission arm.

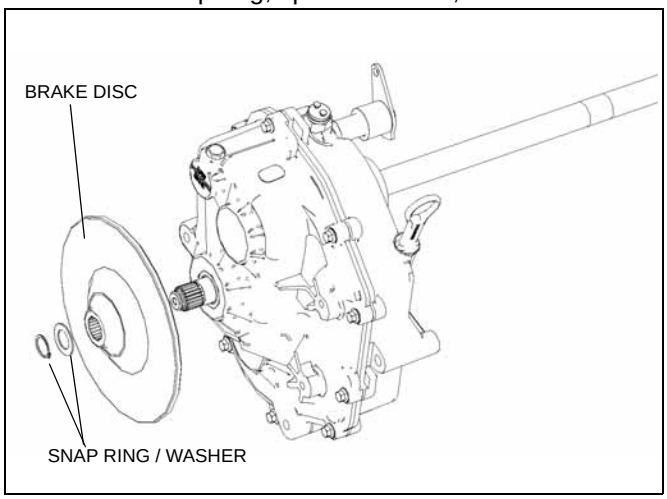


5. Remove REVERSE light wire connector from sensor.
6. Remove angle drive housing, adaptor key, flangette, gasket, and bearing from drive shaft and tunnel.
7. Remove three transmission retaining bolts. Note all alignment shim quantities and locations for reassembly.
8. Lift and maneuver transmission to free drive shaft coupler.
9. Maneuver transmission until it can be removed from the unit. Use care not to damage coolant lines.
10. Inspect transmission, brakes, suspension and track for excessive wear. Check bearings for excessive movement or rough feeling. Replace if necessary.

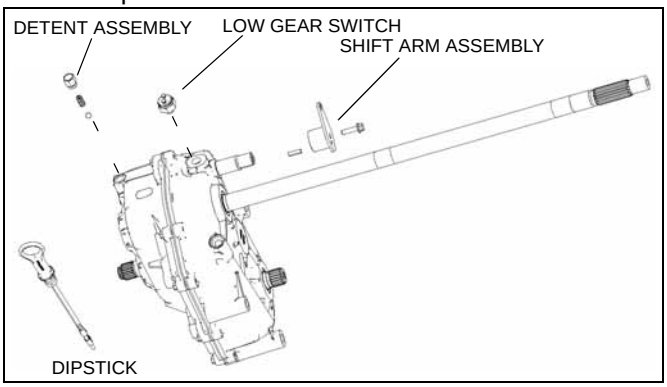
## Inspection

**NOTE: Gearcase disassembly / assembly can be aided by positioning the gearcase on a workbench featuring a hole for the long jackshaft.**

1. Remove drain plug and drain transmission oil into suitable container.
2. Remove snap ring, spacer washer, and brake disc.

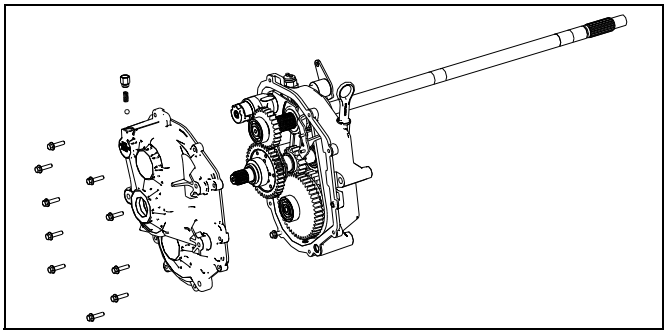



3. Remove shift arm assembly, shift detent assembly, and dipstick.

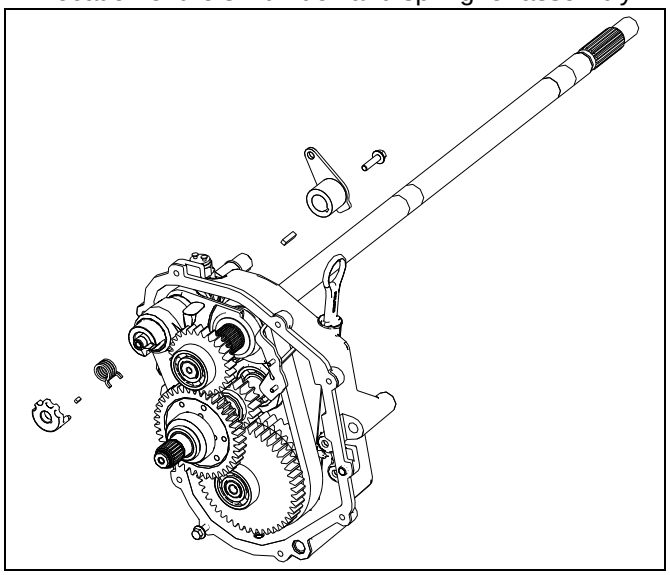


4. Remove case bolts.

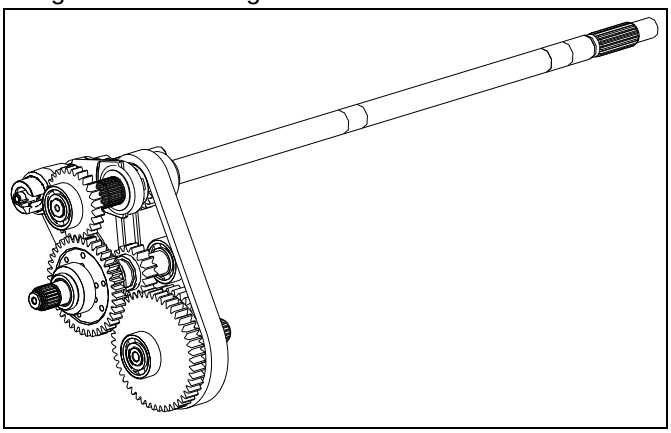
5. Tap cases apart with soft faced hammer in the reinforced areas.



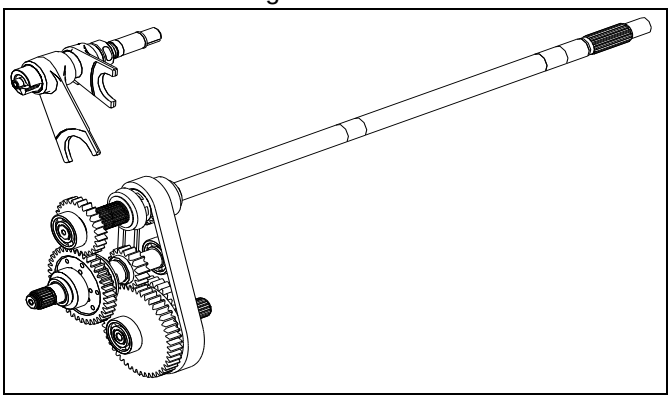
6. Remove the key, shift index and spring. Note the location of the shift index and spring for assembly.



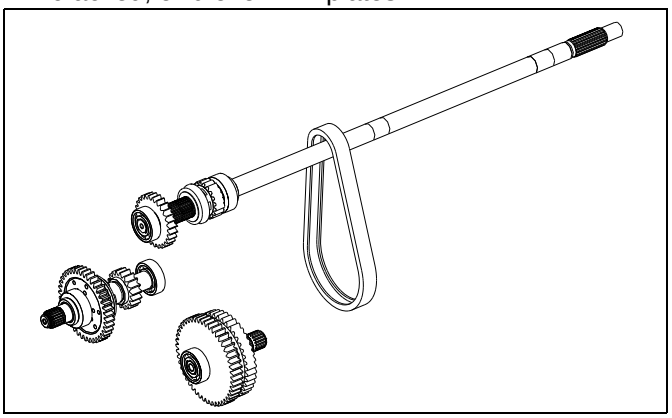
7. Extract the complete chain / gear assembly from the gearcase housing.



8. Remove shift fork shaft from gear cluster. Inspect fork for wear or bending.

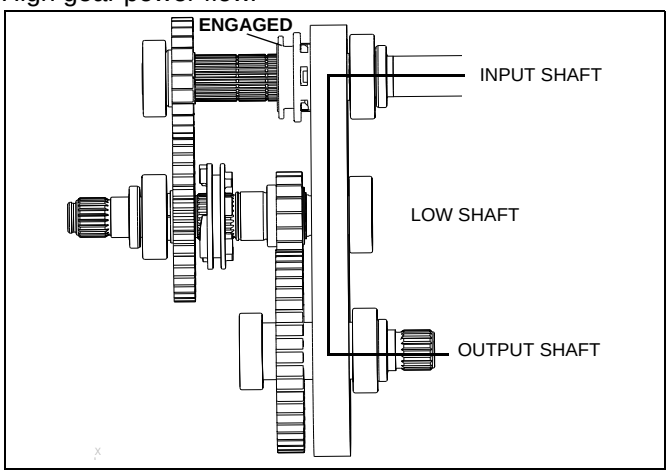


9. Remove chain from input and low gear shafts. Inspect gear teeth for damage. Inspect chain for worn, cracked, or broken link plates.

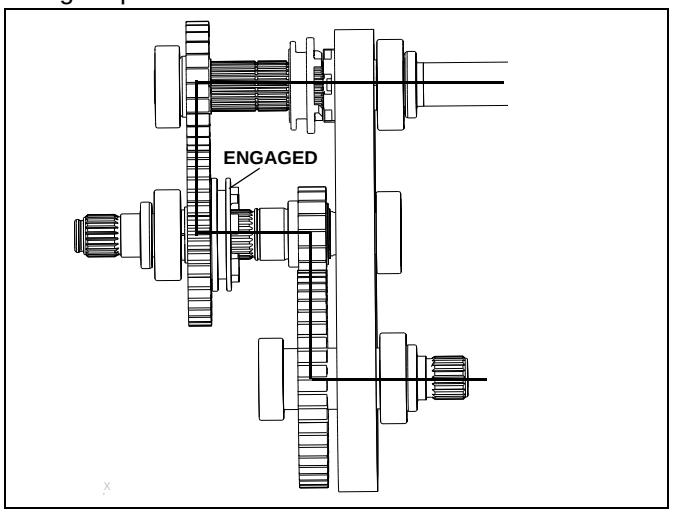


10. Inspect dog gears and slots in mating gears closely. Rounded edges will cause gears to disengage under load. Replace both dog gear and mating gear if edge of dog and/or slot is rounded. Inspect gears for chipped, cracked, or broken teeth.

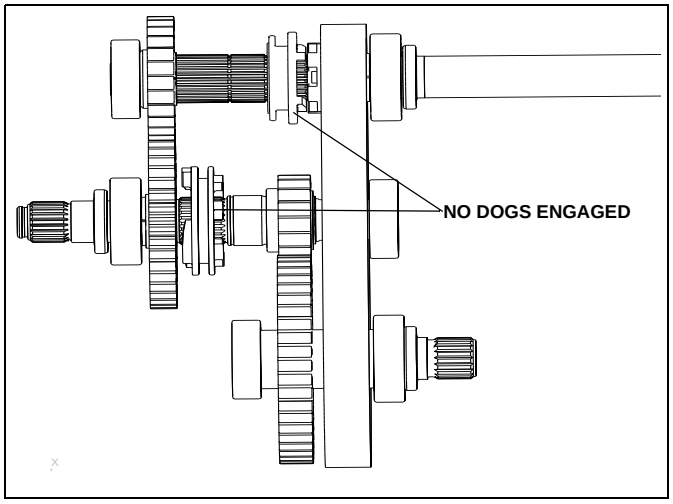
High gear power flow.



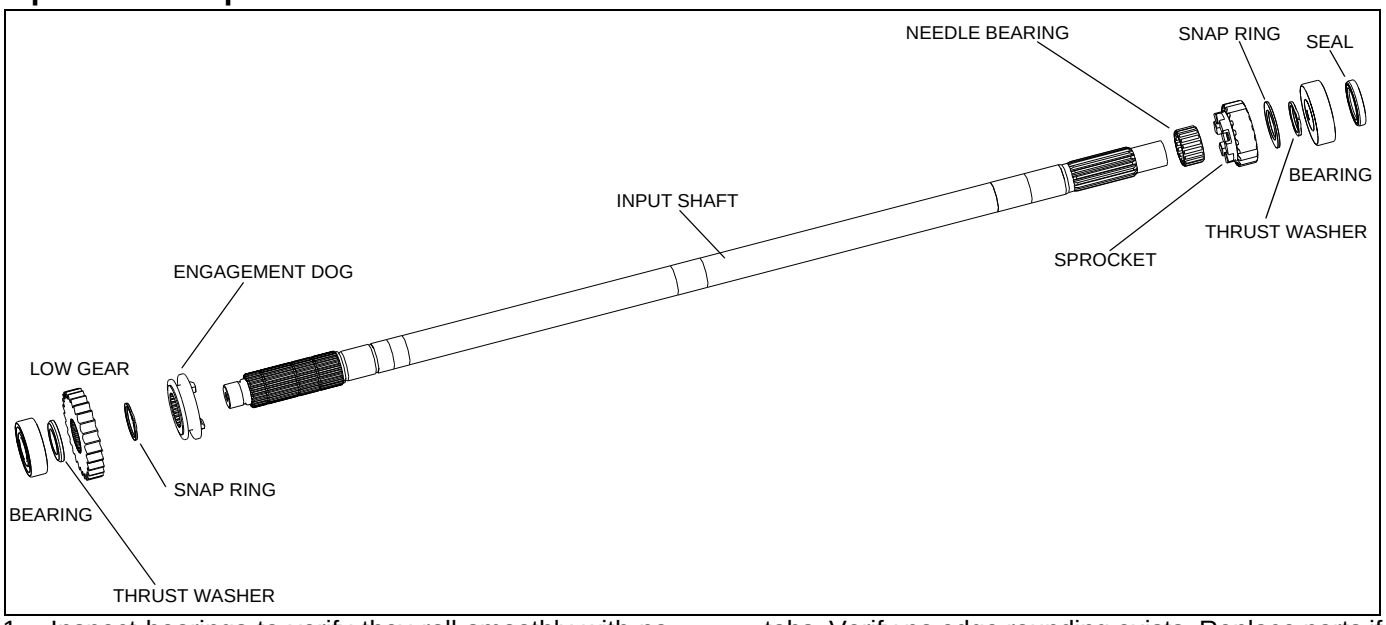

Low gear power flow.




Neutral.

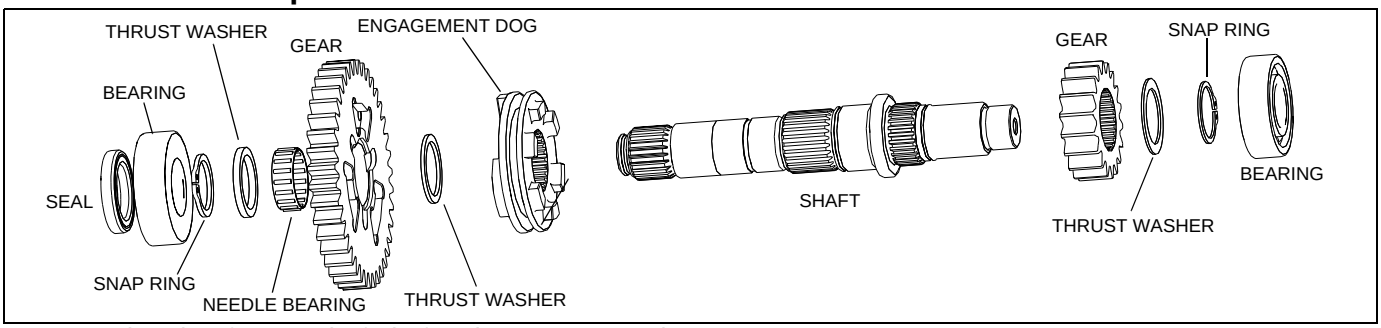


## Input Shaft Inspection



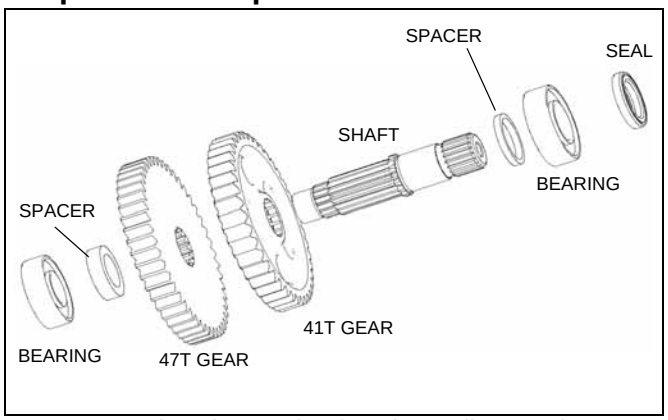

1. Inspect bearings to verify they roll smoothly with no flat spots.
2. Remove bearings using a bearing splitter and press.
3. Discard seals and thrust washers. Replace with new parts.
4. Inspect gear and input shaft teeth for rounded edges and abnormal wear. Replace parts with new where applicable.
5. Inspect engagement dog and sprocket engagement tabs. Verify no edge rounding exists. Replace parts if engagement tabs are rounded-off.
6. Inspect needle bearing cages and rollers. Verify cages are not cracked and rollers are free from flat spots.
7. When installing a new bearing, press on, or support inner race while pressing bearing onto shaft.
8. Lubricate needle bearings and splines with recommended gearcase lubricant.

## Low Gear Shaft Inspection



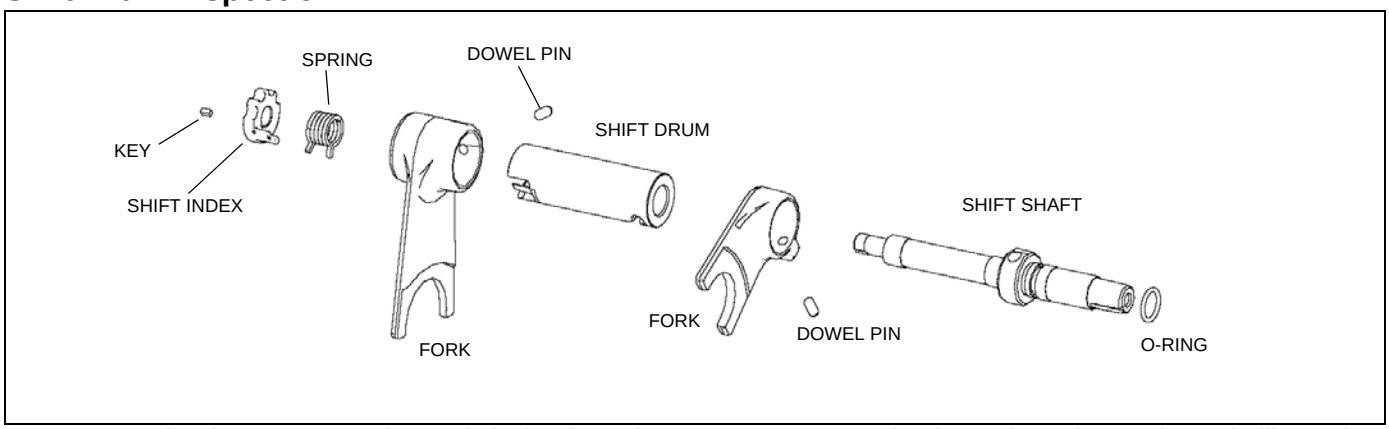

1. Press bearing from end of shaft using a press and bearing separator.
2. Closely inspect drive dogs. Replace gear and mating gear if rounded, chipped or broken.
3. Inspect needle bearings for wear or cracks on cage. Shiny spots on cage indicate wear and the bearing should be replaced. Inspect shaft and thrust washers for galling or wear. Always replace snap rings if removed.

## Output Shaft Inspection




1. Remove bearings using bearing splitter and press.
2. Inspect bearings to ensure they roll smoothly with no flat spots.
3. Discard seal and spacers. Replace with new parts.
4. Inspect gear and spline teeth for rounded edges and/or abnormal wear. Replace parts as required.

## Shift Drum Inspection

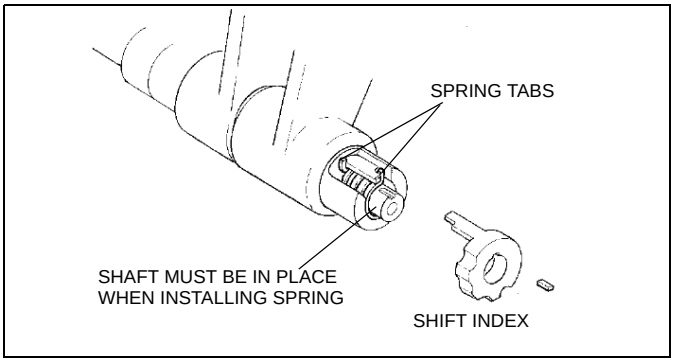



1. Remove the detent cam, spring and shaft. Discard o-ring and replace with new part.
2. Check condition of key-way and key. Inspect indicator, spring legs and detent areas for wear. Replace parts as required.
3. Shift forks can be removed from shift drum by moving shift fork to the end of it's travel and aligning with the corresponding hole in the shift drum. Press dowel pins into inner shift drum. Discard pins and replace with new.
4. Inspect shift forks for abnormal wear and tear. Replace if unevenly worn.
5. Inspect shift drum tracks for damage. Replace drum if any damage is found.
6. When installing shift forks, press dowel pins up to .100″ (2.5mm) below top of bore. Verify pins do not bottom-out on shift grooves.
7. Locate spring in retainer slot as shown in illustration. Arm of shift index must be positioned between both ends of spring.

**⚠ CAUTION**

Wear protective eye wear when installing spring.

**NOTE: The spring must be pre-loaded upon installation. Refer to illustration.**



## Gearcase Assembly

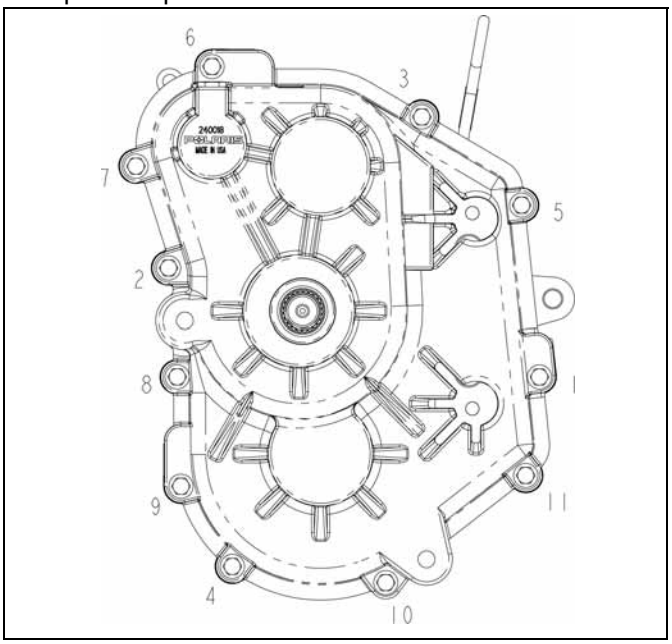
Lubricate all parts before assembly with 80W SCL lubricant.

**NOTE: Wrap input, low gear, and output shaft spline ends with electrical tape to prevent seal damage during assembly.**

1. If the oil deflector was removed from the outer cover, apply Loctite 242 to screw threads and torque to specification.

| = T |
|---|
| Oil Deflector Screws<br>8 Ft.Lbs. (11 Nm)<br>Apply Loctite 242 |

2. Install chain on input and low gear shaft.
3. Add output gear assembly with chain.
4. Add shift fork assembly.
5. Install entire assembly in case half making sure the splines do not damage the case seals.
6. Clean mating surfaces with alcohol or acetone. Apply Loctite 5699™ Flange Sealant to the case mating surfaces.
7. Install outer case. Torque bolts to specification using specified pattern.




| = T |
|---|
| Gearcase Case Fasteners<br>9 Ft.Lbs. (12 Nm) |

8. Install brake disc. Install detent ball, spring, and plug. Torque detent plug to specification.

| = T |
|---|
| Detent Plug<br>12 Ft.Lbs. (16 Nm)<br>Apply pipe sealant to threads. |

9. Install the gear selector bell crank. Torque screw to specification.

| = T |
|---|
| Bellcrank Screw<br>9 Ft.lbs. (12 Nm) |

10. Install the low gear switch. Torque to specification.

| = T |
|---|
| Low Gear Switch<br>21 Ft.Lbs. (28 Nm) |

11. Install the drain plug.

| = T |
|---|
| Drain Plug<br>8 Ft.Lbs. (11 Nm) |

12. Fill case with 20 Ounces (600cc) Polaris 80W SCL Fluid.

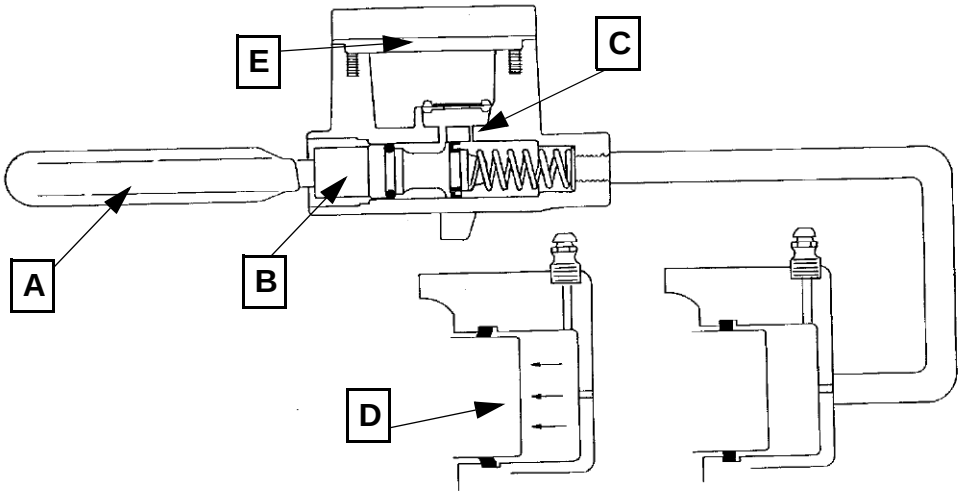
## Gearcase Installation

1. Tip unit onto right side. Grease the driveshaft coupler and install onto end of driveshaft.
2. Install the jackshaft flange and set screw bearing on the driven shaft end.
3. Carefully install the gearcase unit. Verify the jackshaft is inserted through the bulkhead flange hole.
4. Install lower front mounting bolt before coupling to shaft. Once bolt is started into transmission housing, align coupling with drive shaft and jack shaft splines. Keep transmission flat and lower gradually to prevent binding of coupler.
5. Install remaining transmission mounting bolts. Reinstall shim washers in original positions and tighten bolts securely.

**NOTE: Proper transmission / jackshaft alignment is critical for bearing service life.**

6. Loosen set screws and seat driveshaft in transmission coupler stub shaft. For ease of assembly, make sure track has no pressure against drive shaft.
7. Reattach transmission shift linkage and shift light connector. Check transmission fluid level and fill if necessary
8. Install brake caliper. Secure fasteners to 20 ft.lbs. (27Nm).
9. Reinstall and secure muffler.
10. Loosen rear idler bolts.
11. Reinstall driven clutch and spacers onto jackshaft and tighten.
12. Reinstall clutch offset washers on jackshaft and install driven clutch. Using the clutch alignment tool, adjust driven clutch to achieve proper offset.
13. Torque driven clutch retaining bolt to specification.
14. Lift and support rear of unit and align track to specifications found in the Maintenance section. Make sure rear idler wheel spacer location is correct before tightening idler wheels.

## BRAKE SYSTEM




### Overview

The Polaris snowmobile hydraulic brake system consists of the following components or assemblies: brake lever, master cylinder, hydraulic hose, brake caliper (slave cylinder), brake pads, and a brake disc which is secured to the drive line.

When the hand activated brake lever (A) is applied, it contacts a piston (B) within the master cylinder. As the master cylinder piston moves inward it closes a small opening called a compensating port (C) within the cylinder and starts to build pressure within the brake system. As the pressure within the system is increased, the pistons (D) located in the brake caliper move toward the disc and applies pressure to the moveable brake pads. As the lever pressure is increased, the braking effect is increased.

The friction applied to the brake pads will cause the pads to wear. As the pads wear, the piston within the caliper self-adjusts and moves further outward.

Brake fluid level is critical to proper system operation. A low fluid level allows air to enter the system causing the brakes to feel spongy.

### Compensating Port

Located within the master cylinder is a small compensating port (C) which is opened and closed by the master cylinder piston assembly. The port is open when the brake lever is released and the piston is outward. As the temperature within the hydraulic system changes, this port compensates for fluid expansion caused by heat, or contraction caused by cooling. During system service, be sure this port is open. Due to the high temperatures created within the system during heavy braking, it is very important that the master cylinder reservoir have adequate space to allow for the brake fluid to expand. Master cylinder reservoirs should be filled to the top of the fluid level mark on the inside of the reservoir, 1/4" - 5/16" (.6 -.8 cm) below lip of reservoir opening.

This system also incorporates a diaphragm (E) as part of the cover gasket and a vent port (on cover) located between the gasket and the cover. The combination diaphragm and vent allow for the air above the fluid to equalize pressure as the fluid expands or contracts. Be sure the vent is open and allowed to function. If the reservoir is overfilled or the diaphragm vent is plugged, the expanding fluid may build pressure in the brake system and lead to brake failure.

## General Guidelines

**⚠ WARNING**

An unsafe condition exists when air is trapped in the hydraulic brake system. Air in the brake hydraulic system acts like a soft spring and absorbs a large percentage of the pressure developed by the master cylinder. Without this pressure, the braking system cannot develop full braking force to allow for safe, controlled stops. It is extremely important to bleed the brakes properly after any brake system work has been performed or when inspection reveals spongy brakes.

A soft, spongy feeling in the brake lever and/or brake pedal could indicate a hazardous condition in the brake system. Do not operate the vehicle until the failure in the brake system is corrected.

Keep brake fluid tightly sealed and out of reach of children. Brake fluid can accumulate moisture, reducing it's effectiveness.

Contaminated brake discs or brake pads greatly reduce braking performance and increase stopping distance. Do not attempt to clean contaminated pads. Replace them. Clean the brake disc with brake cleaner.

This brake system requires ethylene-glycol based fluid (DOT 4). Do not use or mix different types of fluid such as silicone-based or petroleum-based.

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

**⚠ CAUTION**

Pressure bleeding is not recommended. When fluid surges through the fittings, it is possible to cavitate the fluid and create air in the system. In addition, the fluid stored in a pressure bleeder may be contaminated. Always use fresh DOT 4 brake fluid from a sealed container.

Keep these points in mind when bleeding hydraulic brakes:

- The master cylinder reservoirs have limited capacities. It is easy to empty them during the bleeding procedure. This introduces air into the system which you are trying to purge. Watch the reservoir closely and add fluid when necessary to prevent air from entering the system.
- Apply only light to moderate pressure to the lever or pedal when bleeding the brake system. Extreme pressure will cause a surge of fluid through the small orifices of the brake system when the bleeder screw is opened and introduce air into the system by means of cavitation.
- Small amounts of air can become trapped in the banjo bolt fittings at the master cylinder(s) and junction points of brake lines. These fittings can be purged of air by following a standard bleeding procedure at these fittings (instead of the bleed screw on caliper) if necessary to speed the bleeding process. This is usually only needed if system was completely drained of fluid. Bleed each line connection, starting with the fitting closest to the master cylinder, working toward the caliper, and ending with the bleed screw.
- Always torque banjo bolts and other brake system fittings to specified torque.
- Change fluid every 2 years, or when fluid is dark or contamination is suspected.

## Brake Fluid Replacement & Bleeding

This procedure should be used to change fluid or bleed brakes during regular maintenance, or after complete brake service. Brake fluid may damage painted or plastic surfaces. Take care not to spill, and wipe up any spills immediately. Cover parts to avoid damage.

1. Clean the reservoir cover.

2. Remove the two T-15 Torx™ screws from the cover.
3. Carefully remove the cover and diaphragm assembly from the reservoir.
4. Under the cover, inspect the vent slots under the bellows and remove any debris or blockage.

5. Bleed or replace the fluid by attaching a clear hose from the caliper bleeder fitting to a clean container. Be sure the hose fits tightly on the bleeder fitting.
6. Pump the brake lever a few times and hold.
7. Slowly open the bleeder fitting and let the old fluid or air escape. You will feel the lever release as you let the fluid or air escape.
8. Pump the brake lever a few times and hold it again.
9. Repeat steps 7 and 8 until you see new brake fluid coming from the caliper bleeder fitting or if you are bleeding the air, repeat this step until you see only fluid coming out. This may take several intervals.

10. Torque the bleeder screw to 8-11 ft-lb (11-15 N-m).

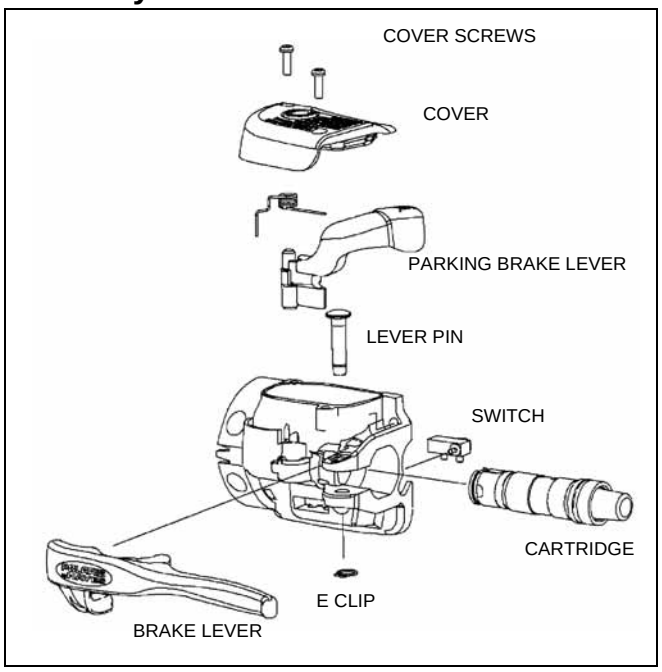
| = T |
|---|
| Bleeder Screw: 8-11 ft-lb (11-15 N-m) |

11. When adding fluid, add DOT 4 brake fluid to 1/4-5/16" (.6-.8 cm) from the reservoir top.
12. Install cover and diaphragm assembly.
13. Tighten the cover screws to 16-20 in-lb (1.8-2.3 N-m).

| = T |
|---|
| Cover Screws: 16-20 in-lb (1.8-2.3 N-m) |

14. Field test machine before putting into service. Check for proper braking action and lever reserve. Lever reserve is when the lever is firmly applied, the lever reserve should be no less than 1/2" (1.3 cm) from the handlebar.
15. Verify that the sight glass indicates a full reservoir.
16. Check brake system for any fluid leaks.

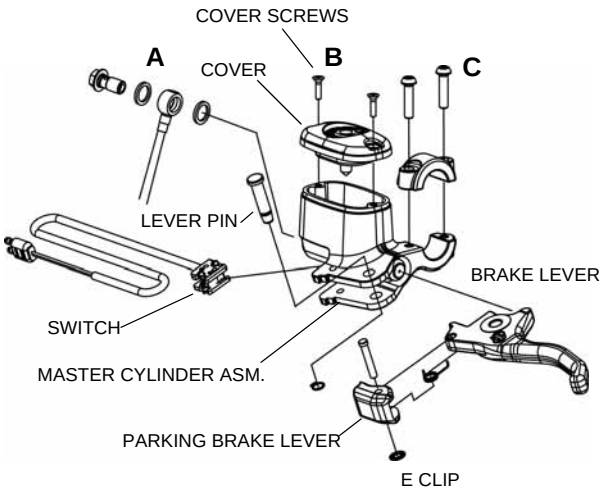
## Master Cylinder / Lever Service




1. To remove the brake lever, remove the E clip from the lever pin.
2. Extract the pin from the housing, then remove the lever.
3. To remove the parking brake lever, the housing cover must be removed. Once removed, carefully extract the spring noting it its position inside the housing. Remove the parking brake lever.
4. To remove the cartridge, completely drain the brake fluid from the housing. Remove the brake and parking brake levers.
5. Disconnect the brake hose from the cartridge. Carefully pop the cartridge out of the housing.
6. To install the cartridge, lubricate the entire surface with DOT 4 brake fluid.
7. Align the cartridge with the housing tabs, then firmly press the cartridge back into the housing until the cartridge is engaged with the tabs.
8. Refill and bleed the brakes system as outlined in this chapter. See “Brake Fluid Replacement & Bleeding” on page 6.21.


9922854 - 2007-2011 IQ Service Manual

## Cyclone Master Cylinder / Lever Service

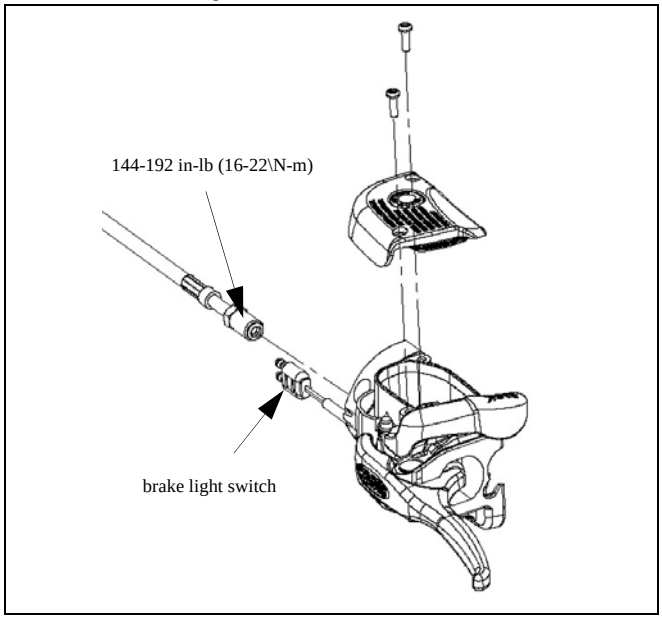



= T

A = Banjo Bolt = 240 - 264 In.Lbs. (27 - 29 Nm)
B = Cover Screws = 6 - 8 In.Lbs. (.7 - .9 Nm)
C = Handlebar Clamp = 60 - 80 In.Lbs. (6.7 - 9 Nm)

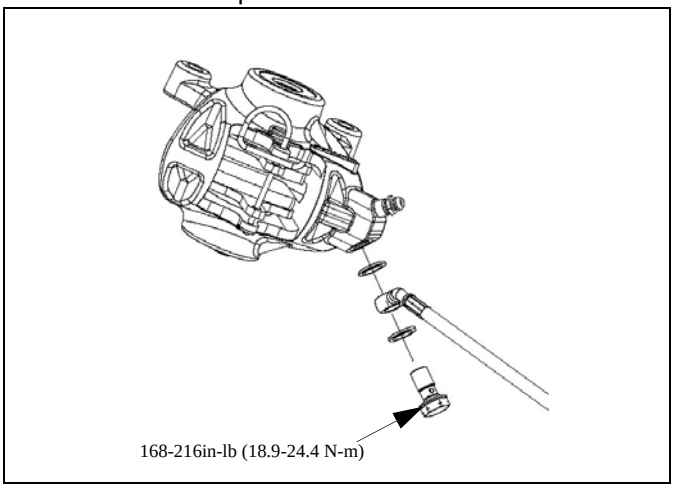
1. To remove the brake lever, remove the e-clip from the lever pin.
2. Extract the pin from the housing, then remove the lever.
3. Disconnect the brake hose from the master cylinder assembly.
4. The master cylinder assembly is not serviceable. Master cylinder reconditioning requires complete replacement.
5. Refill and bleed the brakes system as outlined in this chapter. See “Brake Fluid Replacement & Bleeding” on page 6.21.

## Brake Line Replacement




Follow these steps if the brake line is to be replaced.

1. If needed bleed the brake system by attaching a clear hose to the caliper bleed fitting.
2. Attach the other end to a Mity Vac or similar vacuum tool.
3. Bleed the system of brake fluid.
4. Note the orientation of the brake line. The brake line will need to be replaced in the same orientation.
5. Remove the brake line from the caliper. Cap or cover the end to catch any brake fluid that may still be in the line.
6. Loosen the brake line from the master cylinder 1/4 to 1/2 turn.
7. Remove the 4 screws that hold the master cylinder to the handlebar. This will separate the master cylinder from the switch pack.




8. Unplug the brake light switch harness from the master cylinder.





9922854 - 2007-2011 IQ Service Manual

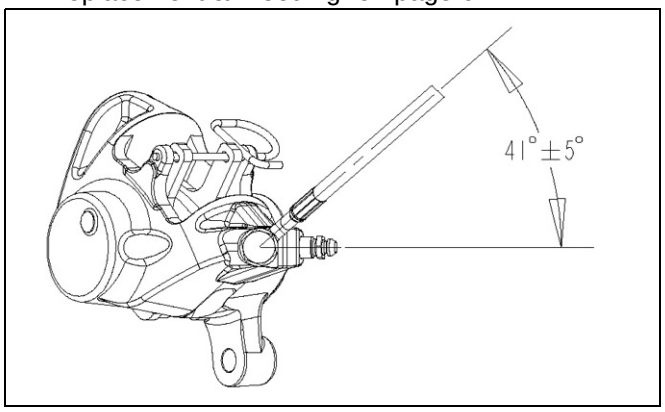
9. Remove the brake line from the master cylinder.
10. Install new brake line on caliper and orientate it as noted in step 4.
11. Torque the caliper banjo bolt to 168-216 in-lb (19-24 N-m).

| = T |
|---|
| Caliper Banjo Bolt: 168-216 in-lb (19-24 N-m) |

12. Insert the new brake line and install into the master cylinder. Torque the brake line to 144-192 in-lb (16-21 N-m).

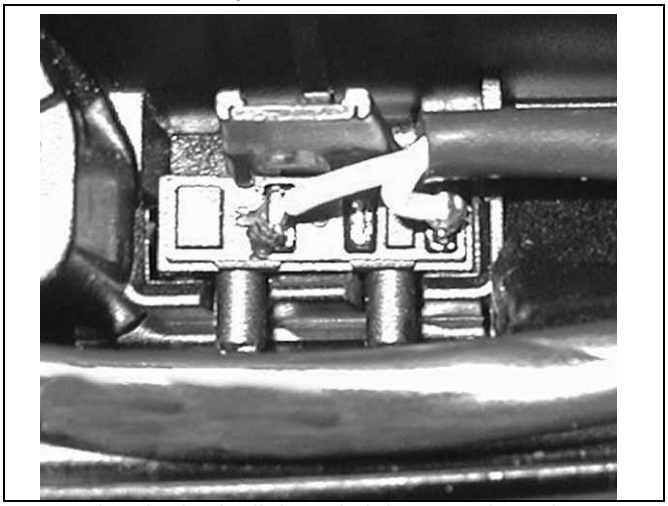
| = T |
|---|
| Brake Line: 144-192 in-lb (16-22 N-m) |

13. Tighten the brake line into the master cylinder in an orientation so that the line does not have any sharp bends when it is installed on the handlebar.
14. Route the brake light switch in the harness correctly.
15. Place the switch pack with the master cylinder onto the handle bar. Two smaller screws should be placed on the top and the longest screw is placed on the lower right.
16. Follow the bleeding procedure. See “Brake Fluid Replacement & Bleeding” on page 6.21.



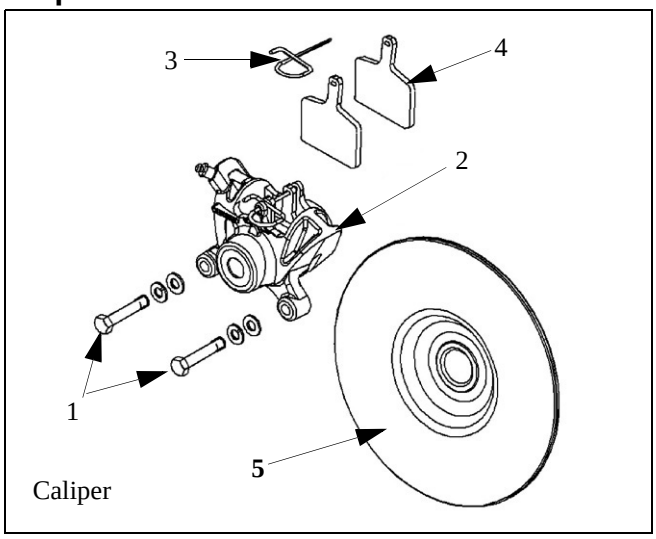

## Brake Light Switch Replacement

1. Remove the 4 screws that hold the master cylinder to the handlebar. This will separate the master cylinder from the switch pack.



2. Unplug the brake light switch harness from the master cylinder.
3. Unplug the brake light switch from the master cylinder.
4. Replace faulty brake light switch into the master cylinder and route wires correctly.
5. Plug the brake switch back into the harness.
6. Replace the master cylinder to the switch pack and insert the smaller screws on the top, the longest one goes into the lower right side.

## Caliper Removal




1. Remove the two caliper bolts that hold the caliper to the chaincase.
2. Remove the caliper from the brake disc.


9922854 - 2007-2011 IQ Service Manual

## Caliper Replacement

The only serviceable item in the brake caliper is the brake pads, piston and seals. If any service is required of the caliper a new caliper is available.

1. The brake line will need to go in the same orientation as it was when it is replaced. Note the orientation of the brake line before removing it.
2. Remove the banjo bolt from the brake line and tie up so that all the brake fluid does not leak out.
3. On a liquid cooled caliper, you will need to drain the coolant from the coolant hoses.
4. Remove the two bolts (1) holding the caliper (2) to the chaincase.
5. Remove the caliper from the chaincase.

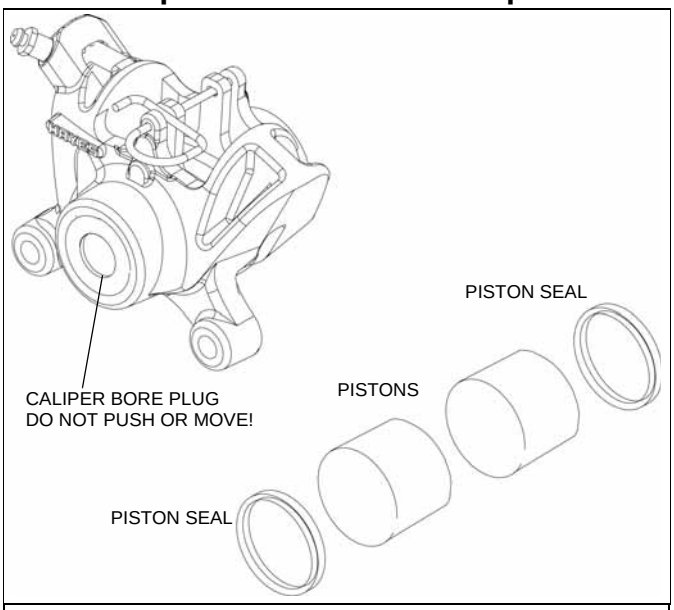
## Caliper Assembly

1. Replace caliper bolts (1) and torque them to 18-20 ft-lb (24-27 Nm).

| = T |
|---|
| Caliper Bolts: 18-20 ft-lb (24-27 N-m) |

2. On a liquid cooled caliper, hook up the coolant lines.
3. Place the brake line on the caliper in the same orientation as it was before it was removed.
4. Clean the threads of the banjo bolt and the threads in the caliper.
5. Follow Brake Line Replacement. See “Brake Line Replacement” on page 6.23.
6. Install banjo bolt into the caliper and torque it to 168-216 in-lb (19-24 Nm).
7. Bleed the brakes. See “Brake Fluid Replacement & Bleeding” on page 6.21.
8. On a liquid cooled caliper you will need to bleed the cooling system of any trapped air.

## Brake Caliper Piston and Seal Replacement




**CAUTION**

NEVER RE-USE PISTON SEALS. ALWAYS REPLACE WITH NEW PARTS.
DO NOT ATTEMPT TO SAND OR POLISH A CALIPER PISTON.

1. If the caliper is liquid-cooled, drain the cooling system down enough to drain hoses attached to caliper, or pinch inlet and outlet hoses.
2. Remove the brake hose from the caliper. Drain the brake fluid into a jar or suitable container.
3. Rotate and remove the brake pad retaining pin and then remove the brake pads. Remove the caliper from the chaincase.

4. Hold the caliper over the brake fluid jar and then push the pistons back into the caliper. This will push the brake fluid in the caliper out of the brake hose banjo fitting hole.
5. Clamp the end of a 1/4” thick 2” x 10” piece of steel to the workbench. Allow the piece of steel to hang off of the bench by 4 - 5”.
6. Position the caliper over the steel plate with the plate firmly against one of the retracted pistons.

**⚠ CAUTION**

DO NOT PUSH ON THE CALIBER BORE PLUG. DOING SO WILL BREAK THE PLUG SEAL AND REQUIRE CALIPER REPLACEMENT.

**⚠ WARNING**

TO AVOID POSSIBLE INJURY, DO NOT PLACE FINGERS BETWEEN PISTONS TO ATTEMPT TO CATCH THEM WHEN APPLYING COMPRESSED AIR.
WEAR EYE PROTECTION WHEN APPLYING COMPRESSED AIR TO CALIPER.

7. Insert a rubber-tipped air nozzle into the brake hose inlet port and apply compressed air to push out the piston.
8. To remove the second piston, lay a rubber sheet on the steel plate and position the caliper over the rubber sheet to seal the open piston bore. Repeat STEP 7.
9. Using a plastic or wood pick, remove both piston seals from the caliper bores. Discard the seals.
10. Clean the caliper and pistons with denatured alcohol and dry with either compressed air or a lint-free rag.
11. Inspect the caliper bores and pistons for pitting, heavy scoring or corrosion. Replace parts if heavily scored or pitted.
12. To assemble the caliper, lubricate two new piston seals with new brake fluid. Install each seal by inserting one point of the seal into the bore groove, and then work the seal around the groove with your index finger. Do not twist, or rip the seals.
13. Coat the piston thoroughly with new brake fluid. Evenly insert each piston into the bores, working each in by hand carefully and slowly. Push each piston down until bottomed out.
14. Reinstall the brake caliper on to the chaincase. Torque fasteners to specification.

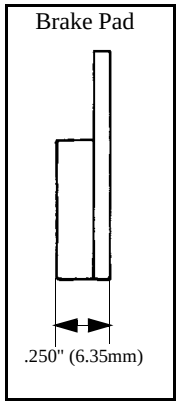
| = T |
|---|
| Caliper Mounting Screws: 18-20 ft-lb (24-27 N-m) |

15. Inspect both brake pads prior to installation. If they are within the pad wear specification, reinstall into caliper.
16. Install the brake hose using the same routing and orientation noted during removal. Torque fitting to specification.

| = T |
|---|
| Caliper Banjo Bolt: 168-216 in-lb (18-24 N-m) |

17. If the caliper is liquid-cooled, reinstall the cooling hoses. Bleed the cooling system after bleeding the brake system if required.
18. Fill and bleed the brake system of air. See “Brake Fluid Replacement & Bleeding” on page 6.21.
19. Test the snowmobile at low speed to verify operation.

## Brake Pad Replacement




Brake pads need to be replaced if the total thickness of the pads and backing are less than .250" (6.35mm).

1. Remove brake pad retaining pin (3).
2. Remove the brake pads (4).
3. Inspect the brake disc (5) for any wear.
4. Replace brake pads in reverse order of removal.

## Brake Disc Replacement

The brake disc should be replaced if the thickness of the disc is below .193"(.49cm).

1. Remove the chaincase.
2. Slide the brake disc from the jackshaft.
3. Check the jackshaft for any damage.
4. Replace the o-ring on the jackshaft
5. Replace the brake disk.
6. Assemble the chaincase.


9922854 - 2007-2011 IQ Service Manual