

GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS)

SERVICE TOOLS

Description	Part Number	Page
COUNTERSHAFT OIL SEAL PUSHER	529 036 222	12
ECM ADAPTER TOOL.....	529 036 166	8
FLUKE 115 MULTIMETER	529 035 868	5, 10
HANDLE	420 877 650	12
OIL SEAL INSTALLER (GEARBOX)	529 035 758	12
OIL SEAL INSTALLER	529 036 204	13

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
FLUKE RIGID BACK-PROBE	TP88	5–6, 8

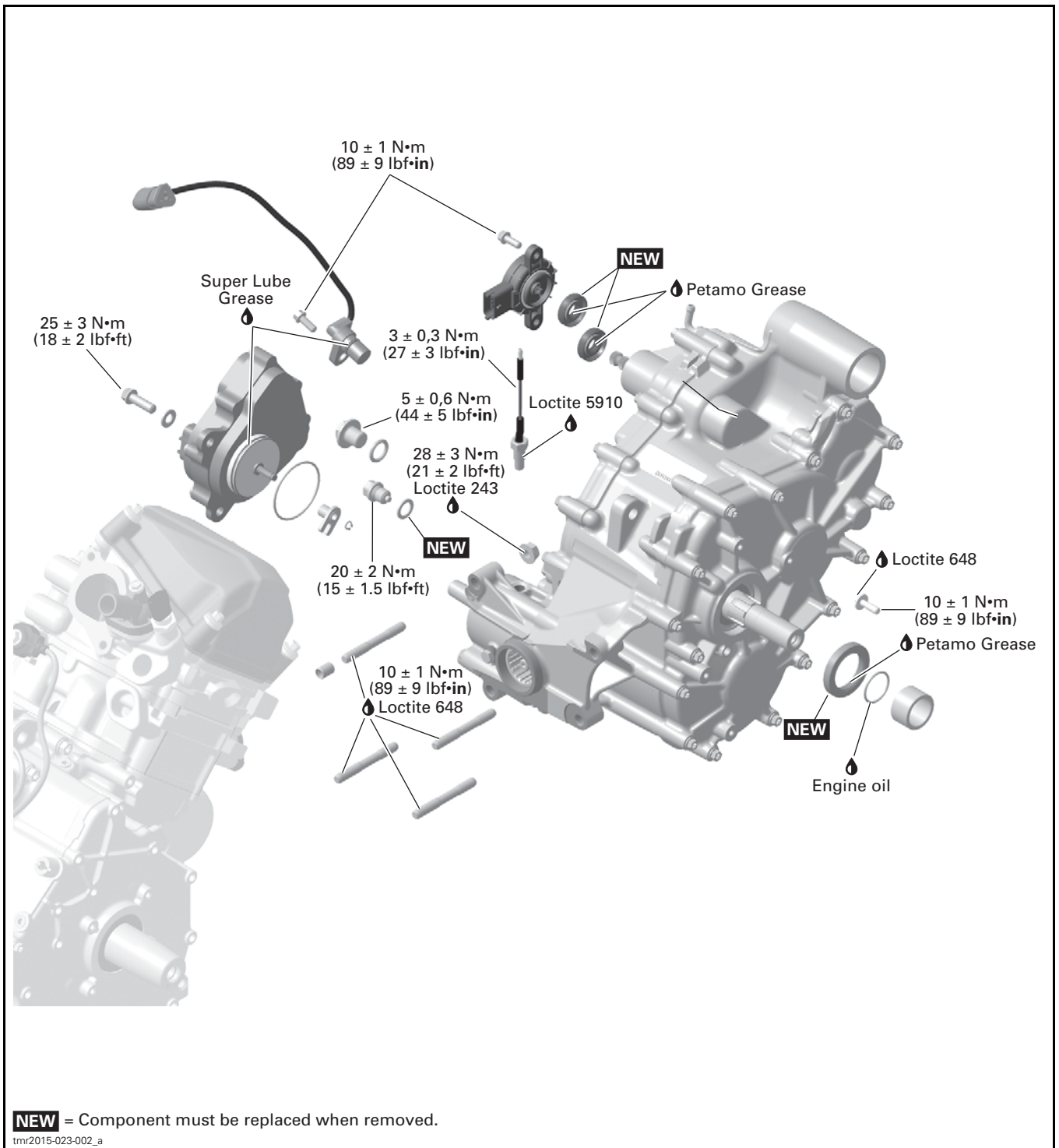
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	27
LOCTITE 5910	293 800 081	9, 25
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	25
PETAMO GREASE GHY 133N	420 899 271	11
SUPER LUBE GREASE.....	293 550 030	7, 10



tmr2015-023-001 a

GEARBOX COMPONENTS AND 4X4 COUPLING MECHANISM

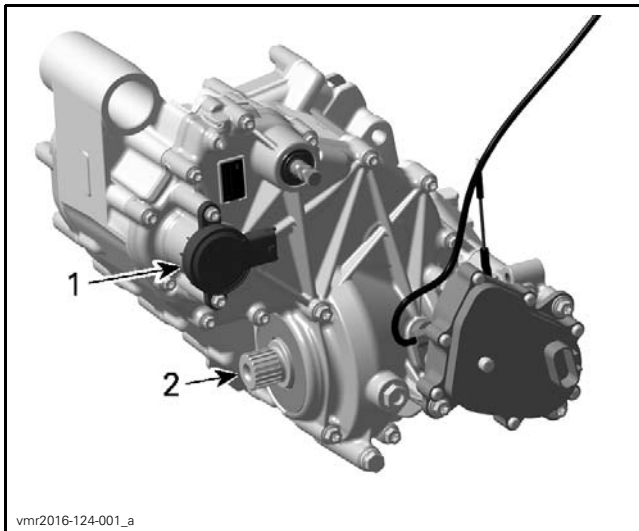


GENERAL

GEARBOX IDENTIFICATION

Gearbox with GBPS

This gearbox is equipped with 1 gearbox position sensor.



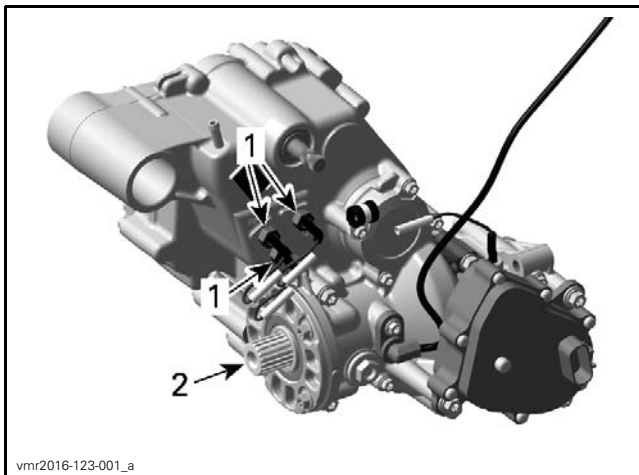
vmr2016-124-001_a

GEARBOX, RIGHT HAND SIDE

1. Gearbox position sensor
2. Output shaft

Gearbox with External Switches

This gearbox is equipped with 3 gearbox position indicator switches.

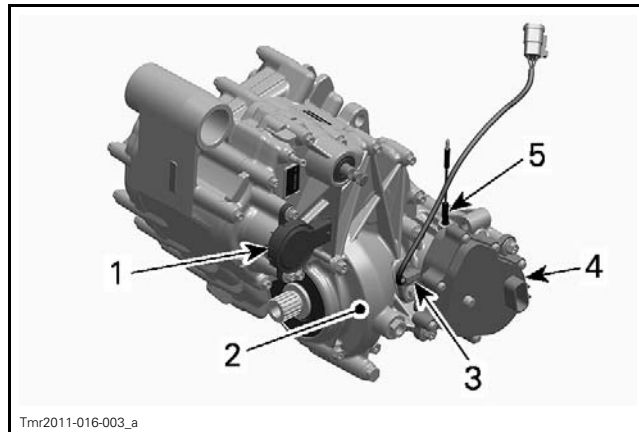


vmr2016-123-001_a

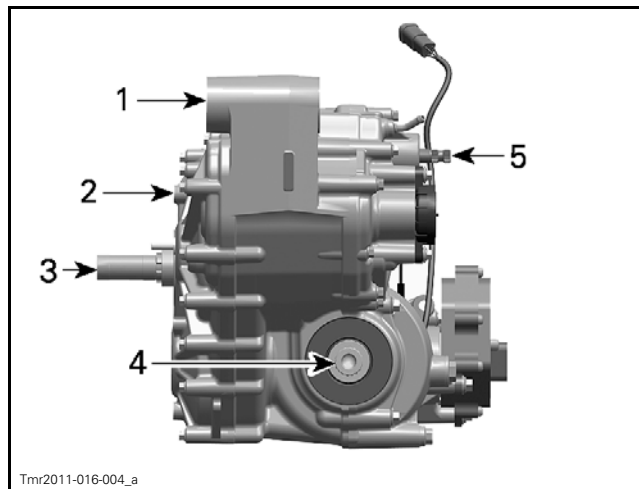
GEARBOX, RIGHT HAND SIDE

1. Gearbox position indicator switches
2. Output shaft

GEARBOX OVERVIEW



- Tmr2011-016-003_a
1. Gearbox position sensor (GBPS)
 2. Right cover
 3. Vehicle speed sensor (VSS)
 4. Actuator
 5. 4WD indicator switch



- Tmr2011-016-004_a
1. Center housing
 2. Left cover
 3. Countershaft
 4. Output shaft
 5. Shift shaft

TROUBLESHOOTING

UNUSUAL GEARBOX NOISE AND/OR VIBRATIONS

1. Low oil level in gearbox.
 - Oil leakage from gearbox. Replace damaged gasket(s) and/or oil seal(s).
2. Defective bearings.
 - Bearing(s) do(es) not turn smoothly. Replace bearing(s).
3. Damaged or worn gears.
 - Inspect gears for damages or missing teeth. Replace respective gears.

GEAR INDICATION FAILS

1. Defective gearbox position sensor (GBPS).
 - Perform a gearbox position sensor test.
 - Damaged wires. Repair as required.

GEAR(S) IS (ARE) HARD TO SHIFT

1. Incorrect shift rod adjustment.
 - Adjust shift rod (refer to SHIFT ROD in SHIFTER subsection).

4 WHEEL DRIVE INDICATION FAILS

1. 4WD indicator switch failure.
 - Test 4WD indicator switch. Replace as required.
 - Bad contact. Check for corrosion or loose connector.
 - Damaged wires. Repair as required.

4 WHEEL DRIVE DOES NOT ENGAGE OR DISENGAGE

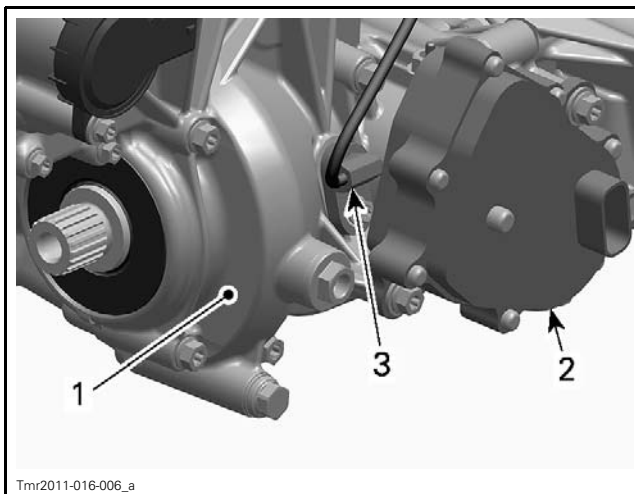
1. Defective 4WD switch.
 - Check 4WD switch operation.
2. Defective actuator.
 - Test actuator.
3. Damaged or worn shifting fork or sleeve.
 - Remove actuator and inspect shifting fork and sleeve.

PROCEDURES

VEHICLE SPEED SENSOR (VSS)

VSS Location

The vehicle speed sensor is located on the right housing of the gearbox, behind the actuator.



1. Right housing of gearbox
2. Actuator
3. VSS (Vehicle Speed Sensor)

The VSS connector is located between the cylinders, behind the OPS cover.

VSS Access

To reach the VSS, refer to *BODY* subsection and remove the RH engine cover

To reach the VSS connector, remove the OPS cover.

VSS Wire Identification

FUNCTION	PIN	COLOR - SENSOR CONNECTOR	COLOR - WIRING HARNESS CONNECTOR
12-volt input from fuse F5	A	RED	VIOLET/BLUE
Speed signal (to cluster pin 9)	B	WHITE	PINK
Ground (to ECM C3)	C	BLACK	GREEN/BROWN

VSS Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay activated	Fuse 5 of fuse block 1 (from main relay R2)

Testing the VSS Input Voltage

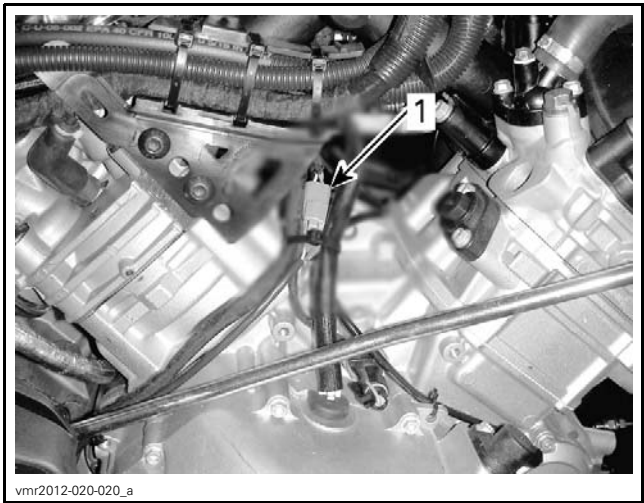
1. Set multimeter to Vdc.

REQUIRED TOOL
FLUKE 115 MULTIMETER (P/N 529 035 868)

2. Turn ignition switch ON.
3. Set emergency engine stop switch to RUN.
4. Back-probe the VSS connector.

REQUIRED TOOL
FLUKE RIGID BACK-PROBE (P/N TP88)

Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



1. VSS connector

5. Measure voltage as per following table.

VEHICLE SPEED SENSOR INPUT VOLTAGE TEST		
TEST PROBES		RESULT (KEY ON)
PIN A VIOLET/BLUE wire	PIN C GREEN/BROWN wire	Battery voltage

If voltage is not as specified, test positive and ground circuits separately.

Testing the VSS Signal

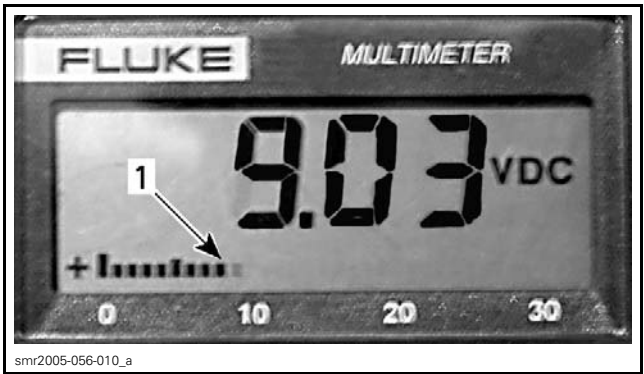
1. Lift rear of vehicle so that rear wheels are off the ground.
2. Set transmission to 2WD and to NEUTRAL.
3. Back-probe the VSS connector.

REQUIRED TOOL
FLUKE RIGID BACK-PROBE (P/N TP88)

4. Turn ignition switch ON.
5. Set emergency engine stop switch to RUN.
6. Set multimeter to Vdc.
7. Measure voltage while slowly rotating rear wheels by hand.

VEHICLE SPEED SENSOR SIGNAL TEST		
TEST PROBES		RESULT (WHILE ROTATING WHEELS)
PIN B WHITE wire	PIN C BLACK wire	Alternate reading between battery voltage and 0 Vdc

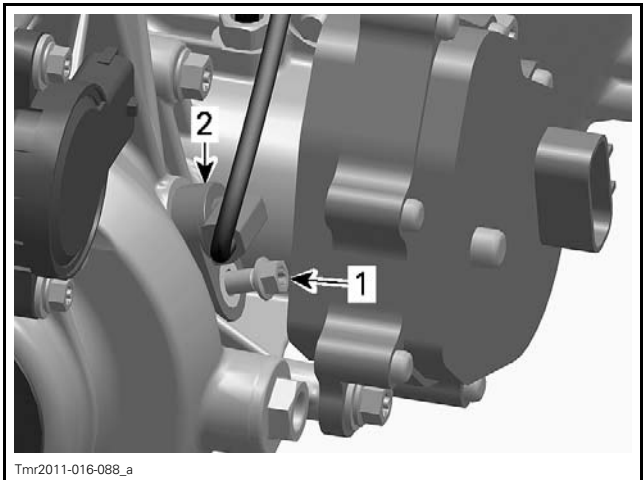
NOTE: Since we measure pulsating voltage, the numeric display will continuously change. The analog display may be easier to follow.



1. Analog display

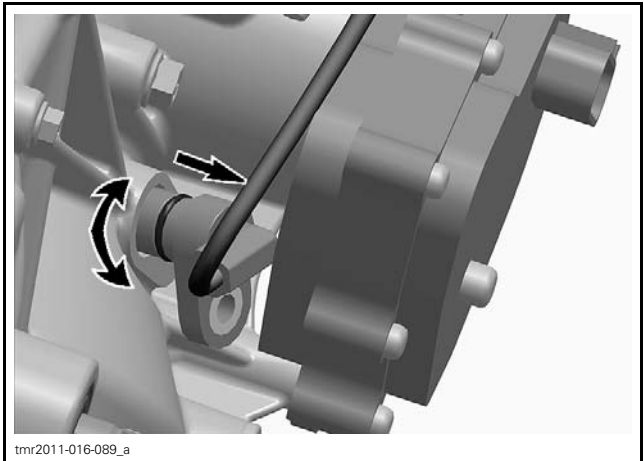
Removing the VSS

Remove screw retaining the VSS.



1. Screw
2. VSS

Turn sensor and weave it out of the gearbox right cover.



Installing the VSS

For installation, reverse the removal procedure. Pay attention to the following.

Lubricate VSS O-ring.

VSS O-RING	
Service product	SUPER LUBE GREASE (P/N 293 550 030)

Tighten VSS retaining screw to specification.

TIGHTENING TORQUE	
VSS retaining screw	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

GEARBOX POSITION SENSOR (GBPS)

GBPS Reset

When replacing the gearbox position sensor (GBPS), it is required to reset (re-zero) its values for proper operation.

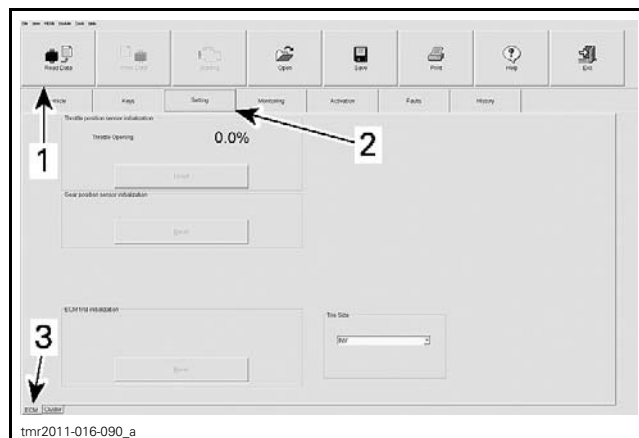
A reset must be carried out each time any of the following parts has been replaced:

- Gearbox assembly
- Shift drum
- GBPS
- ECM.

1. Connect vehicle to the latest applicable version of B.U.D.S. software, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

NOTE: Ignition key must stay ON and emergency engine stop switch must remain to RUN during the reset procedure. Otherwise, the procedure must be carried out again.

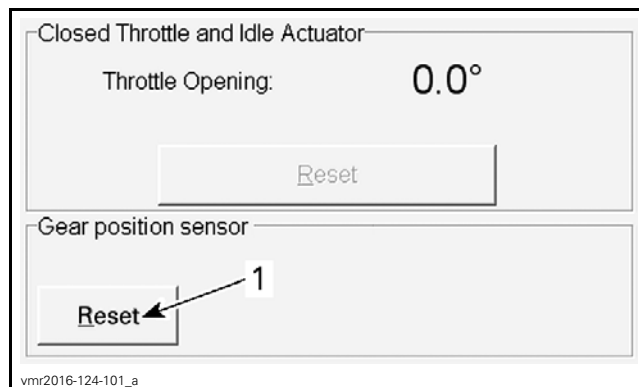
2. In B.U.D.S., select the following:
 - **Read Data** button
 - **Setting** tab
 - **ECM** tab.



TYPICAL

1. Read data button
2. Setting tab
3. ECM tab

3. Make sure that gearbox is set to NEUTRAL position.
4. In the **Gear Position Sensor** area, click on the **Reset** button.



GEAR POSITION SENSOR

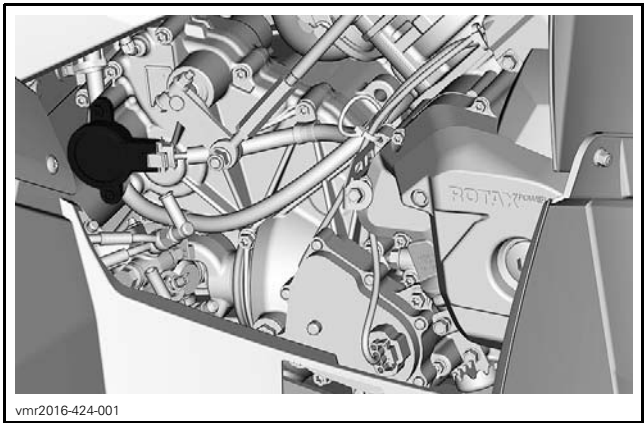
1. Reset button

A message will be displayed if the operation is successful.

5. Close and disconnect B.U.D.S.

GBPS Access

To reach the GBPS sensor, refer to *BODY* and remove the RH engine cover



Testing the GBPS Input Voltage

NOTE: Prior to conduct testing, check fault codes in B.U.D.S.

Back-probe the GBPS connector using FLUKE RIGID BACK-PROBE (P/N TP88) or equivalent.

Test as follow:

MULTIMETER PROBE POSITIONS	VOLTAGE
PIN 1 and PIN 3 of the GBPS connector	5 volts

If voltage is adequate, check GBPS signal wire.
If there is no voltage, check each GBPS input as follows.

MULTIMETER PROBE POSITIONS	VOLTAGE
GBPS connector (pin 1) and battery ground	5 volts
GBPS connector (pin 3) and battery + terminal	Battery voltage

If there is no voltage, check wires and connector pins. Replace or repair defective parts and reset fault codes.

Testing the GBPS Signal Wire Continuity

Unplug ECM connector and connect it to the adapter tool.

REQUIRED TOOL	
ECM ADAPTER TOOL (P/N 529 036 166)	
MULTIMETER PROBE POSITIONS	RESISTANCE @ 20°C (68°F)
GBPS connector (pin 2) and ECM adapter tool (pin D2)	Below 1 Ω

If resistance is out of specification, check wires and connectors. Repair and reset fault codes.

If resistance is good and the other tests succeeded, replace the GBPS and reset fault codes.

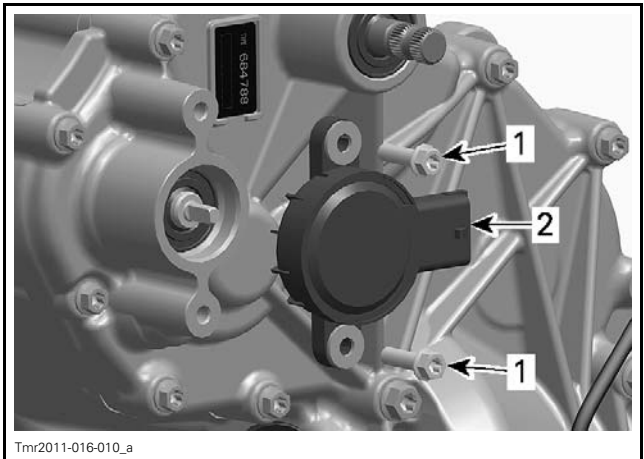
NOTE: The GBPS must be reset.

Removing the GBPS

Set shift lever in NEUTRAL position.

Unplug GBPS connector.

Remove screws and withdraw GBPS.



- 1. Screws
- 2. Gearbox Position Sensor (GBPS)

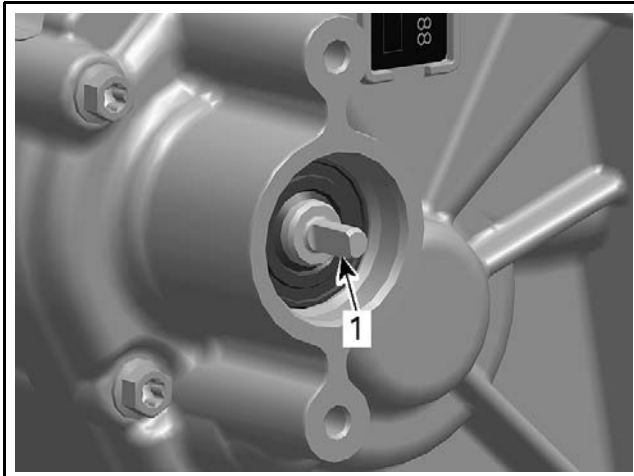
Installing the GBPS

For installation, reverse the removal procedure. Pay attention to the following details.

Shift lever must be in the NEUTRAL position.

Align GBPS with the flat on the shift drum shaft.

IMPORTANT: Do not force to install GBPS if shaft flat is not properly aligned. If alignment is incorrect, check shift rod adjustment.



1. Flat on shift drum shaft

TIGHTENING TORQUE	
GBPS retaining screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Reset the GBPS. Refer to *GBPS RESET* in this subsection.

4WD INDICATOR SWITCH

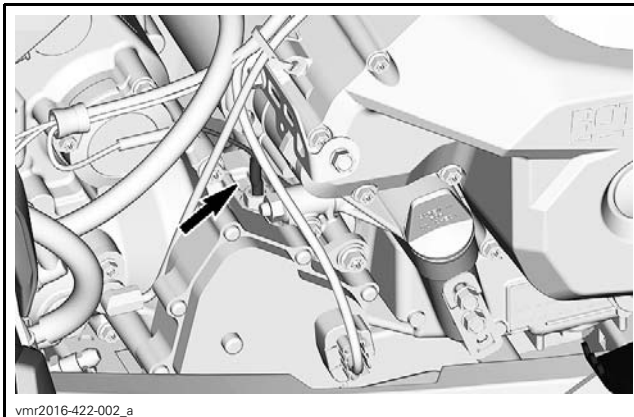
4WD Indicator Switch Access

To reach the 4WD indicator switch, refer to *BODY* and remove the RH engine cover.

Removing the 4WD Indicator Switch

NOTE: Clean area of dirt before removing gear-box indicator position switch.

Disconnect 4WD indicator switch connector.



Testing the 4WD Indicator Switch

Measure switch resistance as follows.

SWITCH POSITION	SWITCH WIRE		RESISTANCE
2WD	BLACK/ BEIGE	Engine ground	Close to 0 Ω
4WD			Infinite (OL)

If the resistance is out of specification, replace the 4WD indicator switch.

Installing the 4WD Indicator Switch

For installation, reverse the removal procedure. Pay attention to the following details.

Take care do not damage indicator switch threads during installation.

Apply carefully some sealant on threads of indicator switch.

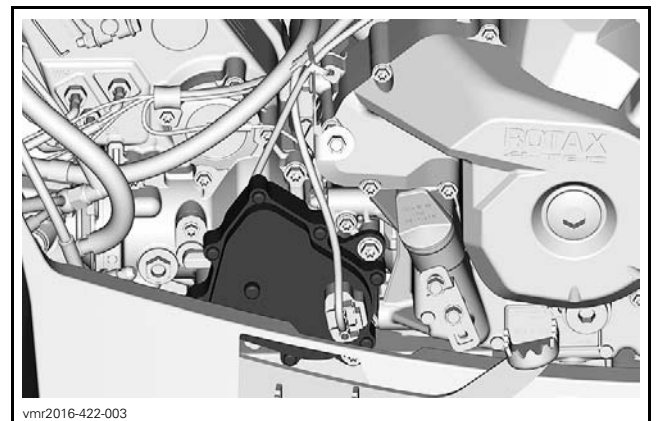
NOTICE Do not apply sealant on switch plunger, as it will lead to switch malfunction.

TIGHTENING TORQUE	
Service product	LOCTITE 5910 (P/N 293 800 081)
Indicator switch	3 N•m ± 0.3 N•m (27 lbf•in ± 3 lbf•in)

4WD ACTUATOR

4WD Actuator Access

To access the actuator, refer to *BODY* and remove the RH engine cover.



Testing the 4WD Actuator

Check if the 2WD/4WD selector works properly.

Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))

REQUIRED TOOL	
FLUKE 115 MULTIMETER (P/N 529 035 868)	

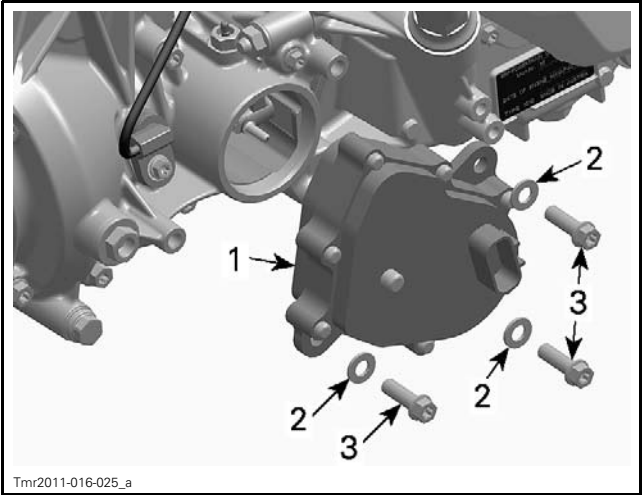
Unplug actuator connector.
Turn ignition key ON.
Set emergency engine stop switch to RUN.
Measure voltage as follows.

SWITCH POSITION	SWITCH WIRE		VOLTAGE
2WD	WHITE/BLUE	WHITE	Battery voltage
4WD	WHITE/BLACK		

If the selector is out of specifications, check wires, connectors and replace the selector if necessary.
If the selector is good, check the vehicle harness.
If the vehicle harness is good, replace the actuator.

Removing the 4WD Actuator

NOTE: Clean area of dirt before removing the 4WD actuator.
Make sure the actuator is in 4WD position.
Remove the RH floorboard.
Place a drain pan under actuator.
Remove actuator screws.



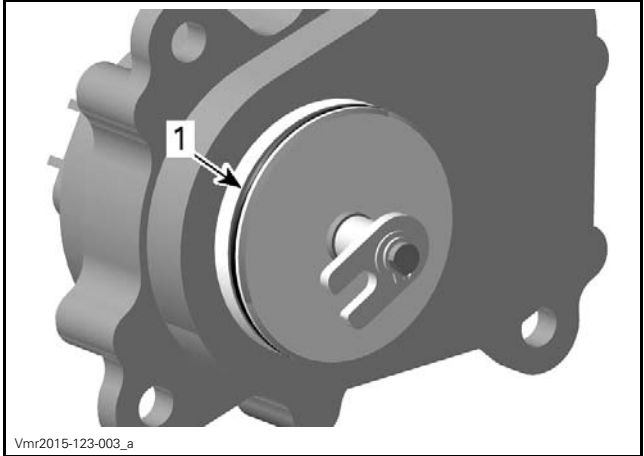
- 1. Actuator
- 2. Washer
- 3. Screw

Pull the actuator out of housing.

Installing the 4WD Actuator

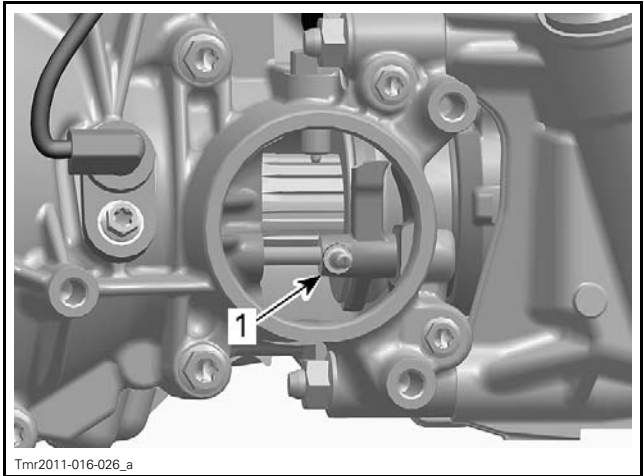
Lubricate actuator O-ring.

ACTUATOR O-RING	
Service product	SUPER LUBE GREASE (P/N 293 550 030)



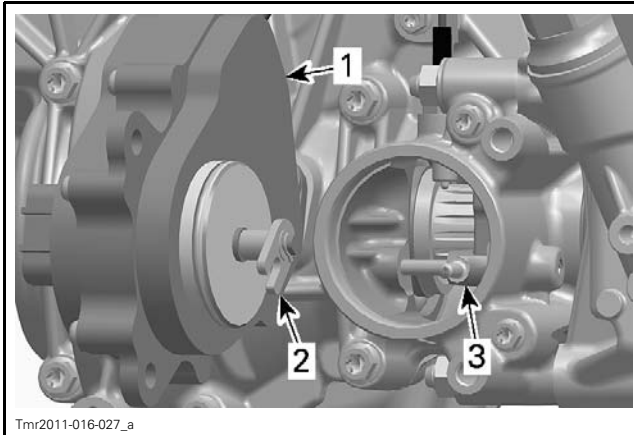
1. Actuator O-ring

Ensure coupling fork is in 4WD position (positioned toward the front of vehicle).



1. Coupling fork in 4WD position

Align the actuator fork with the pin on coupling fork then push the actuator in the housing. See the following illustration to position the actuator correctly.



1. Actuator
2. Actuator fork
3. Coupling fork

Rotate the actuator counterclockwise until it orients itself to mounting position.

NOTICE Do not cut or break the actuator O-ring.

Install all actuator screws and tighten them.

TIGHTENING TORQUE	
Actuator screws	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

Connect actuator.

Lift the front of vehicle.

Turn front wheels. The front propeller shaft should not turn (the PARK position must be selected).

If the front propeller shaft turns, the actuator is not installed correctly. Remove actuator and reinstall it.

Set ignition switch to ON.

Set emergency engine stop switch to RUN.

Select the 2WD position.

Turn front wheel again. The front propeller shaft should turn easily.

If the front propeller shaft does not turn, the actuator is not installed correctly. Remove actuator and reinstall it.

NOTICE Refill gearbox, refer to *GEARBOX OIL FILLING PROCEDURE* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

Install all other removed parts.

GEARBOX OIL SEALS

Gearbox Oil Seal Replacement

Replace oil seals if they are brittle, hard or damaged.

A small flat screwdriver can be used to remove most of these oil seals.

NOTICE Avoid scoring parts during oil seal removal.

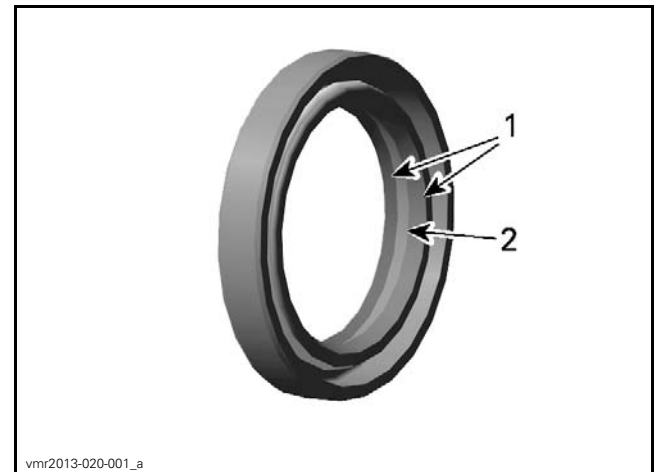
When replacing an oil seal, take this opportunity to inspect the following:

- Check bearings behind each oil seal for contamination and/or metal shavings.
- Check oil seal running surfaces for scratches.

Oil Seal Lubrication

When installing or reinstalling oil seals, use PETAMO GREASE GHY 133N (P/N 420 899 271) to:

- Lubricate sealing lips all around.
- Fill up the room between sealing lips halfway around the perimeter.



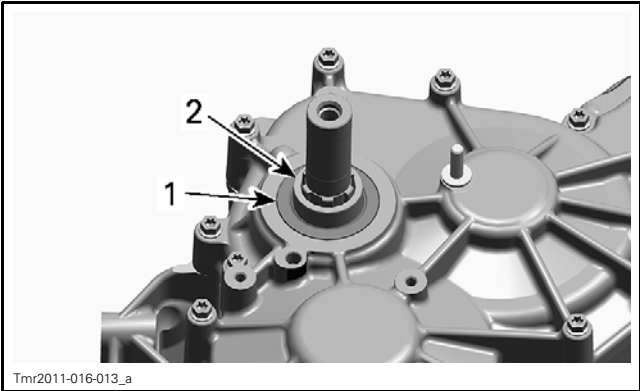
1. Sealing lips
2. Room between sealing lips

Countershaft Oil Seal

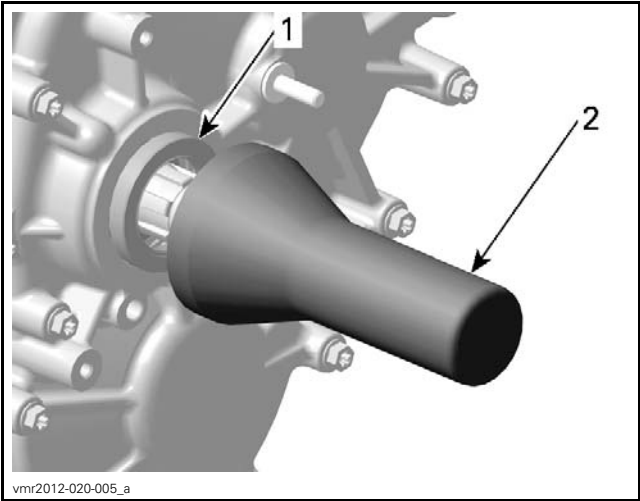
To replace the countershaft oil seal, remove:

- Drive and driven pulleys
- CVT air guide.

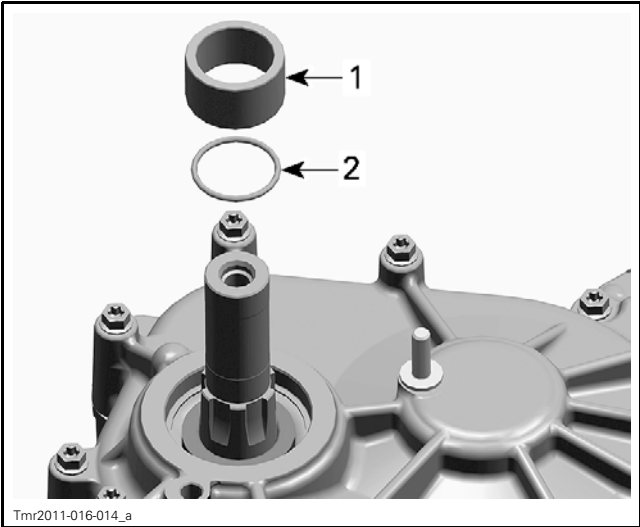
NOTE: When oil seal is removed also inspect O-ring behind distance sleeve.



1. Countershaft oil seal
2. Distance sleeve



1. Countershaft oil seal
2. Oil seal pusher



1. Distance sleeve
2. O-ring

Install countershaft oil seal tool.

REQUIRED TOOL	
COUNTERSHAFT OIL SEAL PUSHER (P/N 529 036 222)	

Shift Shaft Oil Seal

The shift shaft oil seal can be removed without removing the gearbox from the vehicle.

To replace the shift shaft oil seal, refer to *BODY* and remove:

- Seat
- Console
- RH side panel
- RH footrest panel
- Shift plate from shift shaft (refer to *SHIFTER*).

Use a suitable tube with the proper diameter to install the oil seal.

If gearbox housing is apart, use following tools for shift shaft oil seal installation.

REQUIRED TOOL	
OIL SEAL INSTALLER (GEARBOX) (P/N 529 035 758)	
HANDLE (P/N 420 877 650)	

NOTICE Oil seal must be installed with sealing lip toward gearbox.

Shift Drum Shaft Oil Seal

To replace the shift drum shaft oil seal, remove the *GBPS (GEARBOX POSITION SENSOR)*. See procedure in this subsection.

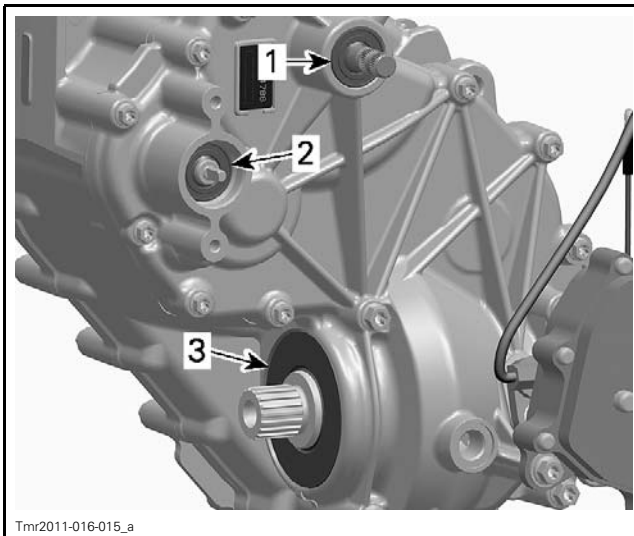
Use a suitable tube with the proper diameter to install the oil seal.

NOTICE Oil seal must be installed with sealing lip toward gearbox.

Output Shaft Oil Seal

To replace the output shaft oil seal, proceed as follows:

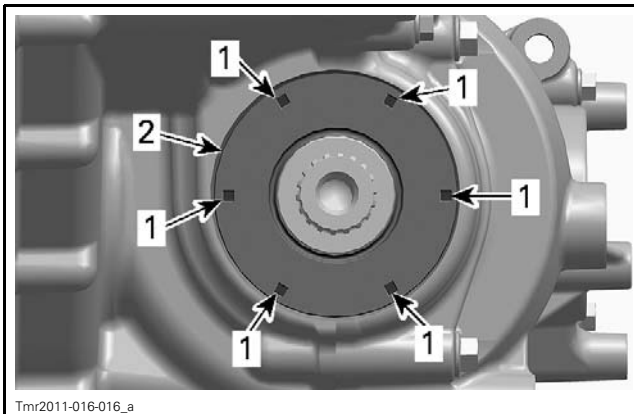
Remove propeller shaft. Refer to *REAR DRIVE* subsection.



1. Shift shaft oil seal
2. Shift drum shaft oil seal
3. Output shaft oil seal

Punch a sharp screwdriver through oil seal for removal.

NOTE: Position screwdriver only in marked areas to avoid damaging the ball bearing behind oil seal during removal.



1. Marked areas for removal
2. Output shaft oil seal

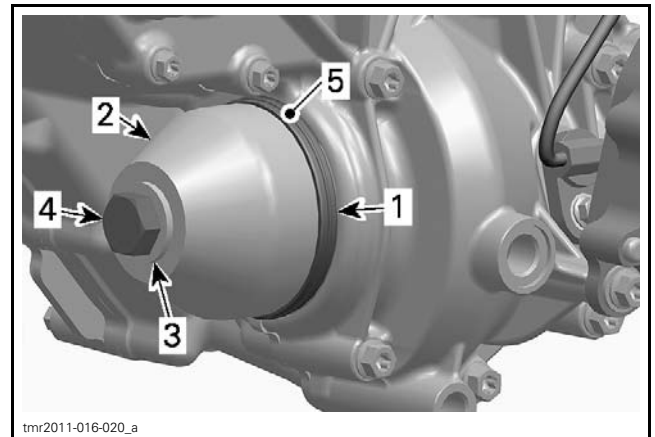
Before beginning the installation ensure gearbox is set to PARK position.

Lubricate sealing lips, refer to *OIL SEAL LUBRICATION* in this subsection.

Apply engine oil on outer diameter of oil seal to avoid damaging it during installation.

Place oil seal on output shaft and install it using the following tools.

REQUIRED TOOL	
OIL SEAL INSTALLER (P/N 529 036 204)	
Flat washer (P/N 250 200 102)	
M12 x 1.25 x 35 hexagonal screw	



1. Output shaft oil seal
2. Oil seal installer
3. Flat washer (P/N 250 200 102)
4. M12 x 1.25 x 35 hexagonal screw
5. Apply engine oil on outer diameter of oil seal

GEARBOX

Removing the Gearbox

Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* for the procedure.

Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection to remove following parts:

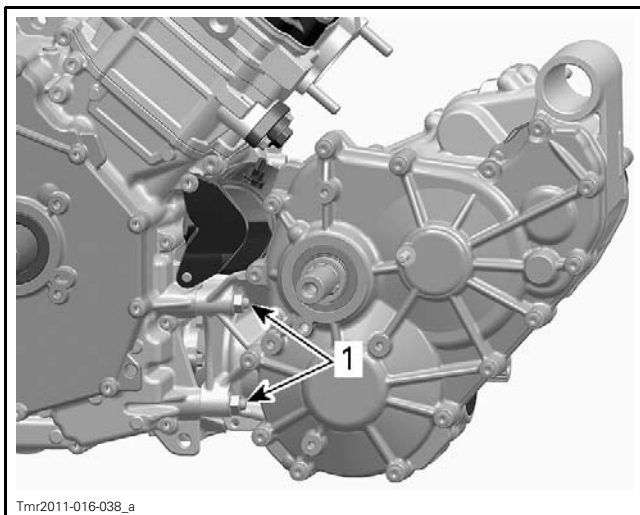
- CVT cover
- Drive and driven pulleys
- CVT air guide.

Drain gearbox. Refer to *GEARBOX OIL DRAINING PROCEDURE* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

Remove *ACTUATOR*, see procedure in this subsection.

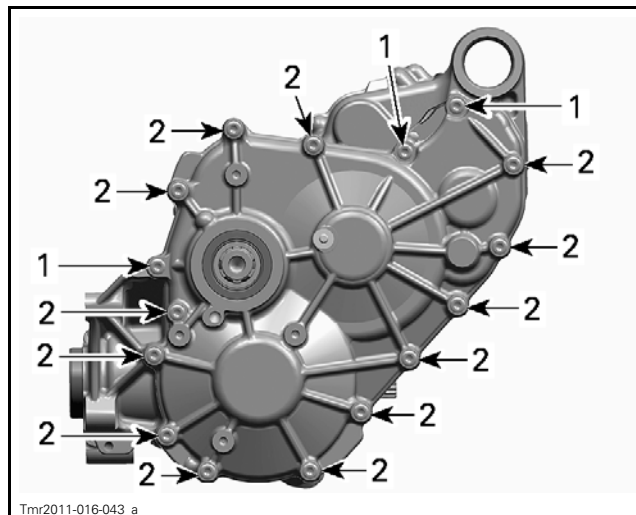
Unscrew the four (4) nuts that attach the gearbox to the engine.

Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



LH SIDE OF ENGINE

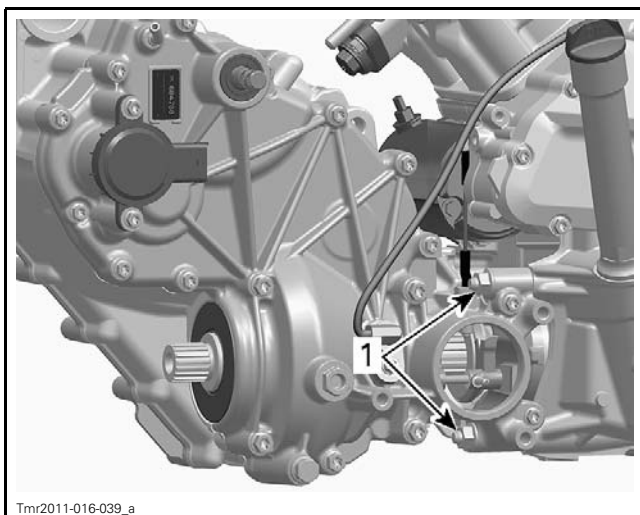
1. Nut M8



1. 3 screws M6 x 35
2. 13 screws M6 x 55

Place the center housing on a wood stand, left cover pointing upwards.

Using a big flat screwdriver and a soft hammer to lift the left cover.



RH SIDE OF ENGINE

1. Nut M8

Pull gearbox to separate it from engine.

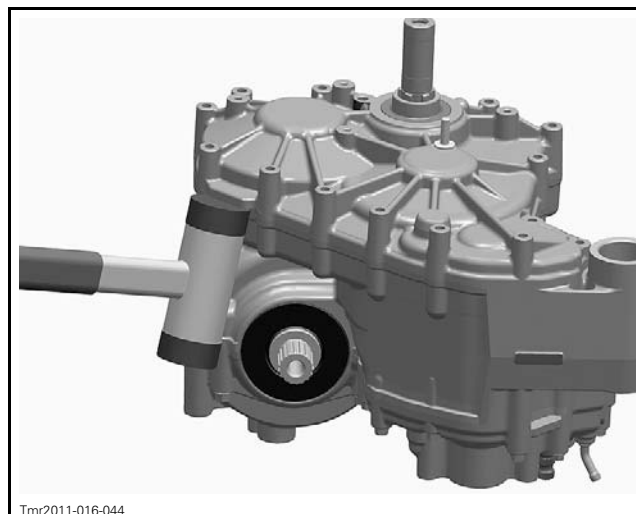
Disassembling the Gearbox

NOTE: During gearbox disassembly, inspect the condition of each part closely.

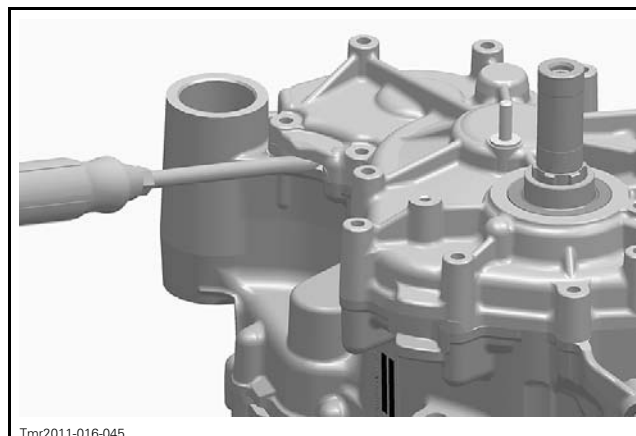
Gearbox Left Cover

Set gearbox to NEUTRAL position.

Unscrew all bolts retaining the gearbox left cover.



POSITION FOR SOFT HAMMER

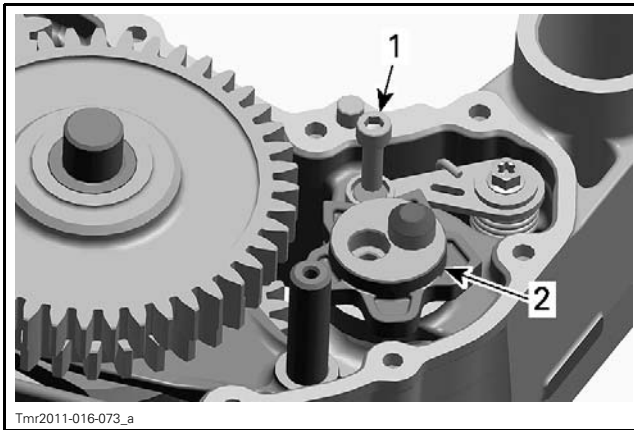


POSITION FOR BIG FLAT SCREWDRIVER

Index Lever and Index Washer

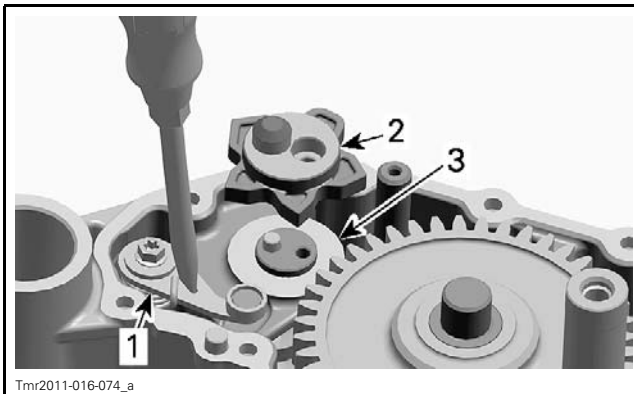
Set gearbox to NEUTRAL position.

Remove screw retaining the index washer to the shift drum.



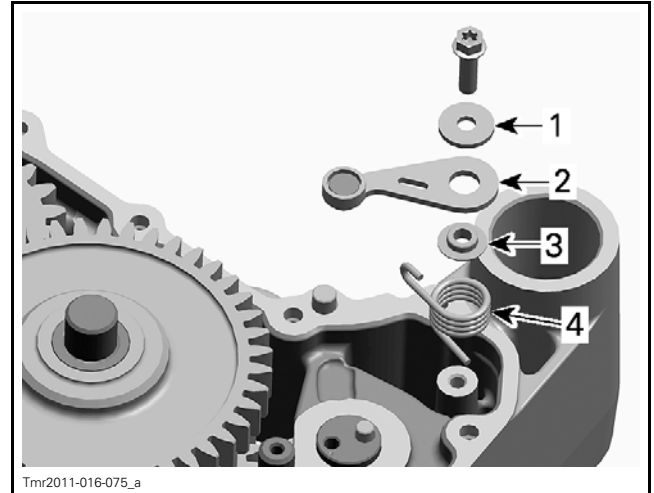
1. Screw
2. Index washer

Insert a flat screwdriver in the slot of index lever. Turn screwdriver clockwise and remove index washer.



1. Index lever
2. Index washer
3. Shift drum

Remove the index lever with washer, step ring and spring.

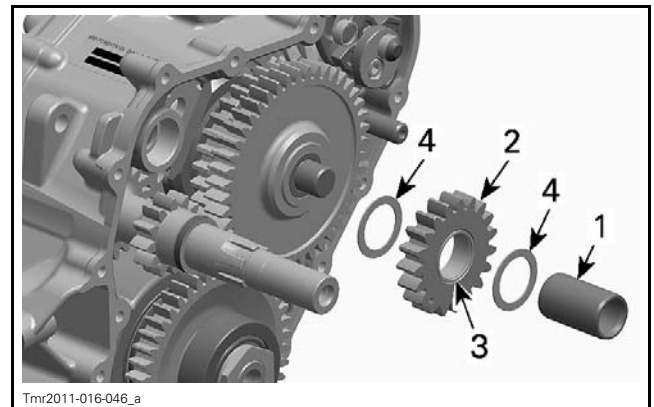


1. Washer
2. Index lever
3. Step ring
4. Index spring

Main Shaft and Shift Forks

Remove bearing pin, reverse intermediate gear and thrust washers.

NOTE: Take care not to lose lower thrust washer during removal.

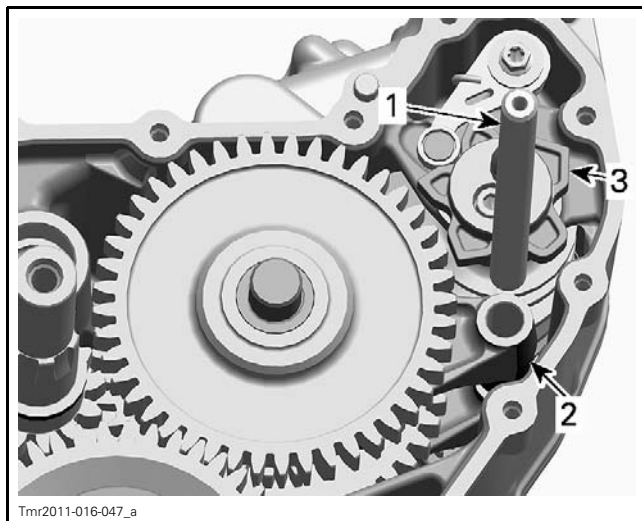


1. Bearing pin
2. Reverse intermediate gear
3. Needle bearing
4. Thrust washers

Remove shift fork shaft.

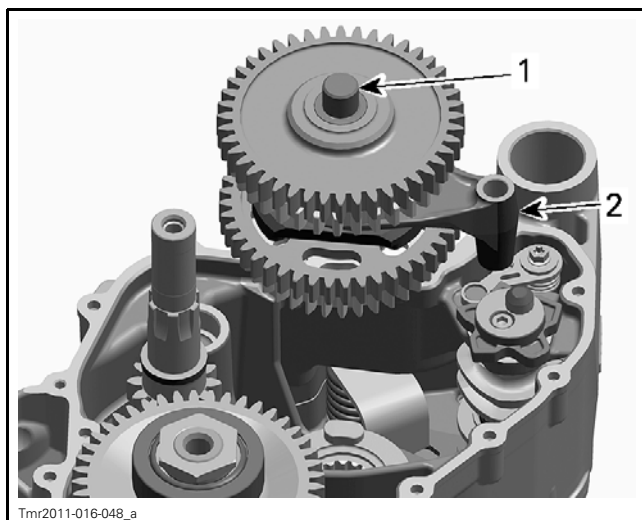
Disengage shift forks from shift drum.

Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



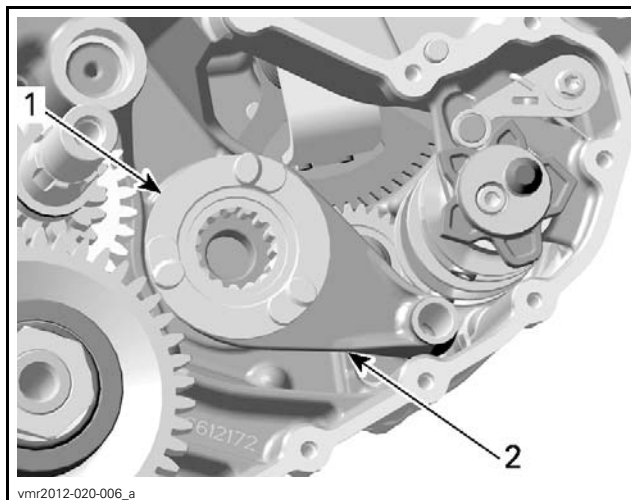
1. Shift fork shaft
2. Shift fork
3. Shift drum

Remove main shaft assembly with shift fork.



1. Main shaft assembly
2. Shift fork

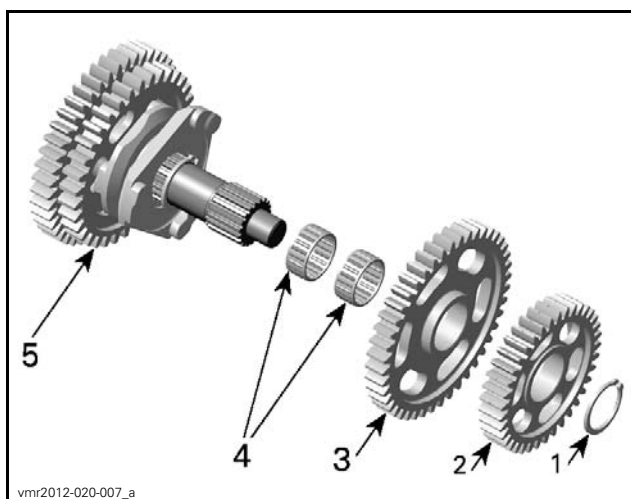
Remove shifting sleeve (HIGH range gear) and shift fork.



1. Shifting sleeve (HIGH range gear)
2. Shift fork

When required, remove from main shaft assembly:

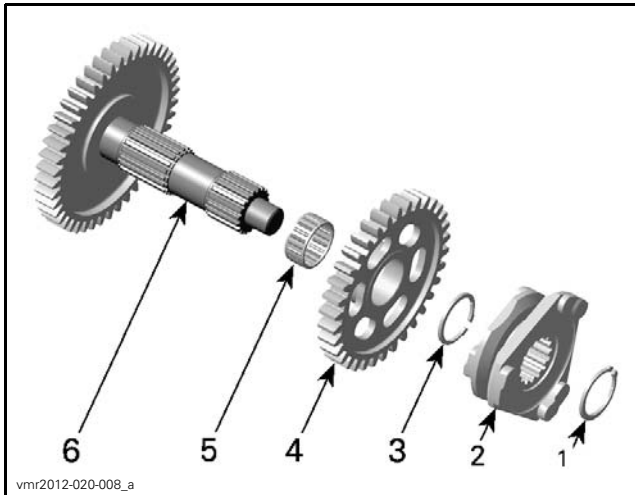
- Snap ring (discard)
- HIGH range gear
- LOW range gear
- Needle bearings.



1. Snap ring
2. Free pinion (HIGH range gear)
3. Free pinion (LOW range gear)
4. Needle bearing
5. Main shaft assembly

Remove from main shaft assembly:

- Snap ring (discard)
- Shifting sleeve (LOW/REVERSE range gear)
- Snap ring (discard)
- REVERSE range gear
- Needle bearing.

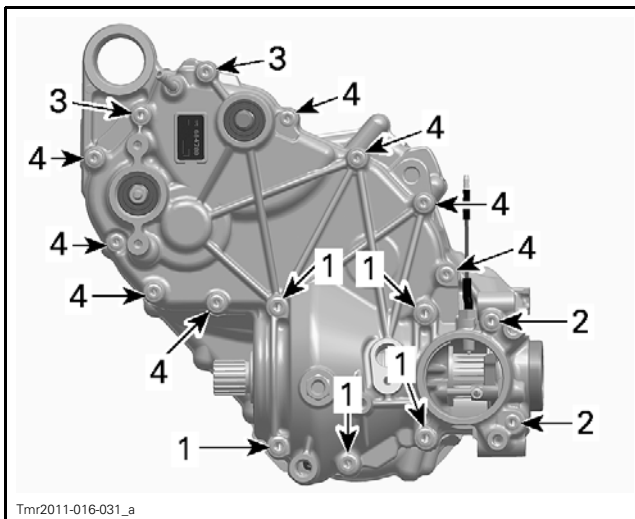


1. Snap ring
2. Shifting sleeve (LOW/REVERSE range gear)
3. Snap ring
4. Free pinion (REVERSE range gear)
5. Needle bearing
6. Main shaft assembly

Gearbox Right Cover

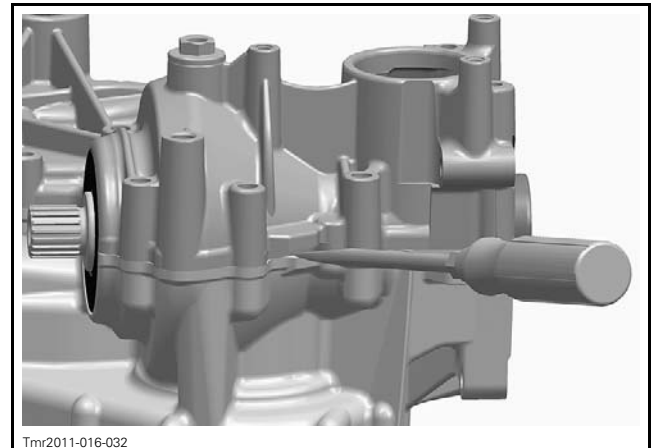
Remove *ACTUATOR* and *GBPS (GEARBOX POSITION SENSOR)*, see procedures in this subsection.

Unscrew all bolts retaining the gearbox right cover.

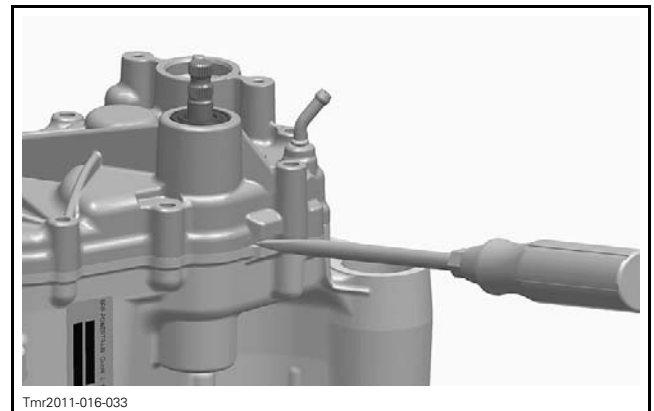


1. 5 screws M8 x 55
2. 2 screws M6 x 85
3. 2 screws M6 x 55
4. 8 screws M6 x 35

To remove cover, use 2 big screwdrivers.



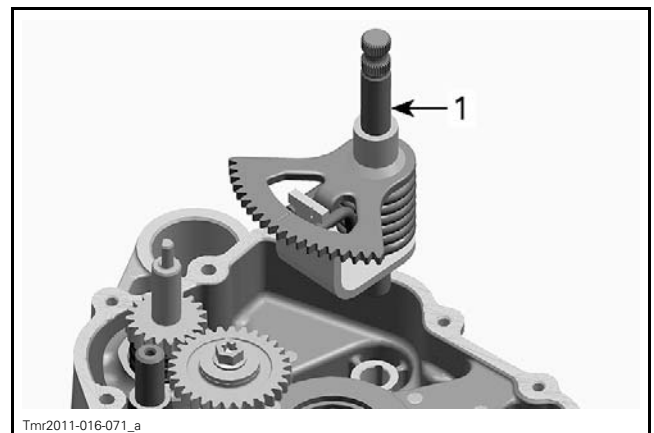
POSITION FOR BIG FLAT SCREWDRIVER



POSITION FOR BIG FLAT SCREWDRIVER

Shift Shaft and Shift Drum

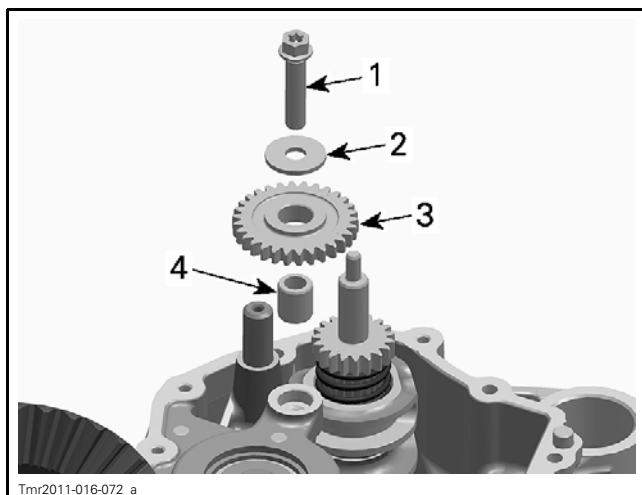
Withdraw shift shaft assembly.



1. Shift shaft assembly

Remove screw retaining the shifting intermediate gear.

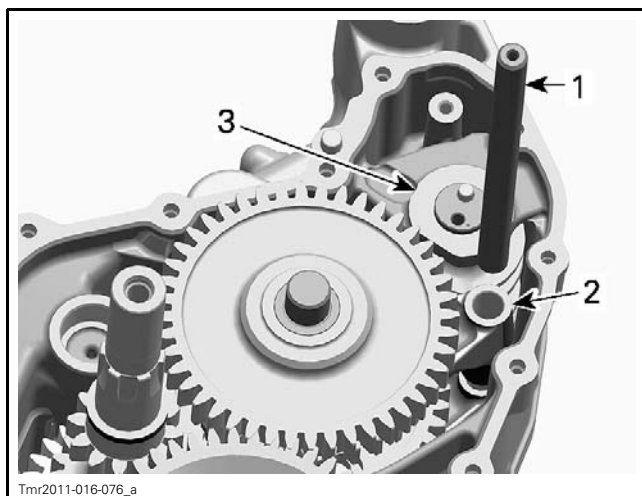
Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



1. Screw
2. Washer
3. Intermediate gear
4. Dowel pin

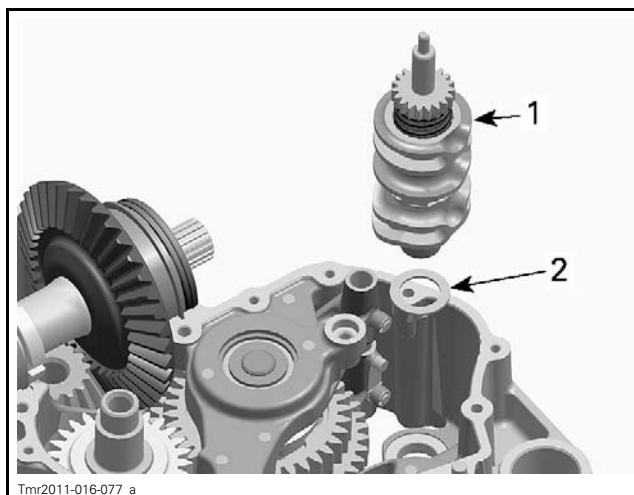
Remove shift fork shaft.

Disengage shift forks from shift drum.



1. Shift fork shaft
2. Shift fork
3. Shift drum

Remove shift drum and thrust washer.

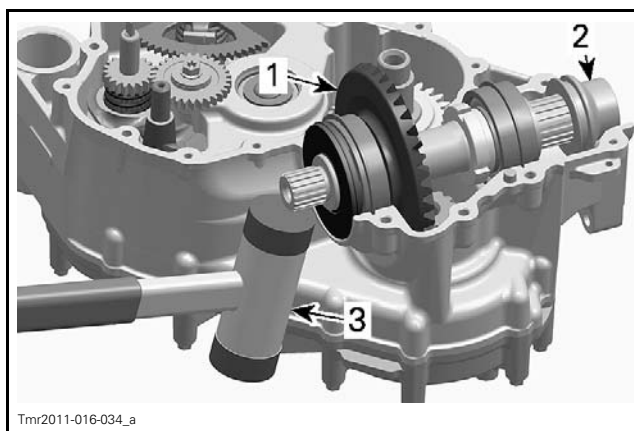


1. Shift drum
2. Thrust washer

Output Shaft and 4x4 Coupling Mechanism

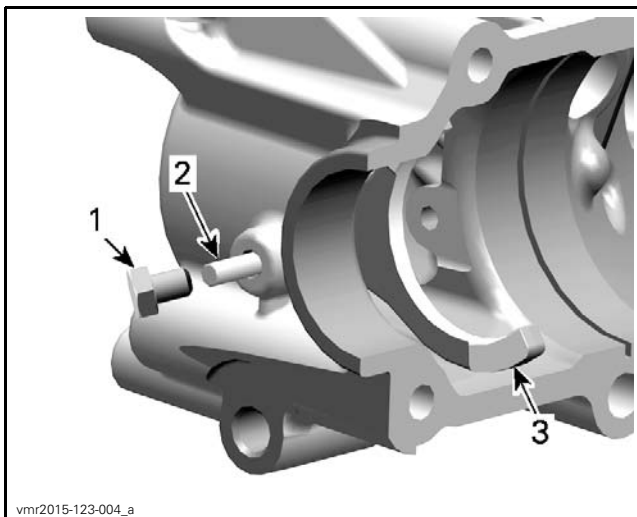
Remove output shaft from center housing and withdraw 4x4 coupling sleeve.

NOTICE Use a soft hammer to remove output shaft.



1. Output shaft
2. 4x4 coupling sleeve
3. Soft hammer

Remove hexagonal screw, coupling fork shaft and coupling fork from right cover.

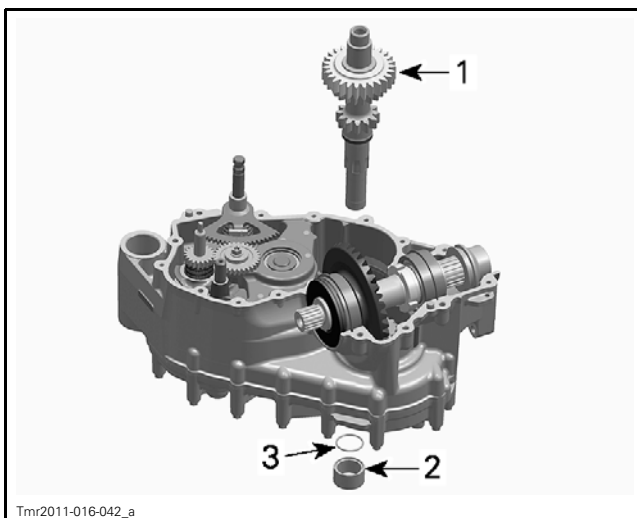


1. Hexagonal screw
2. Coupling fork shaft
3. Coupling fork

Countershaft

Use a soft hammer to push out countershaft from gearbox CVT side.

Remove distance sleeve and O-ring.



1. Countershaft
2. Distance sleeve
3. O-ring

Gearbox Bearings

If necessary heat housing up to 100°C (212°F) before removing ball bearings.

⚠ WARNING

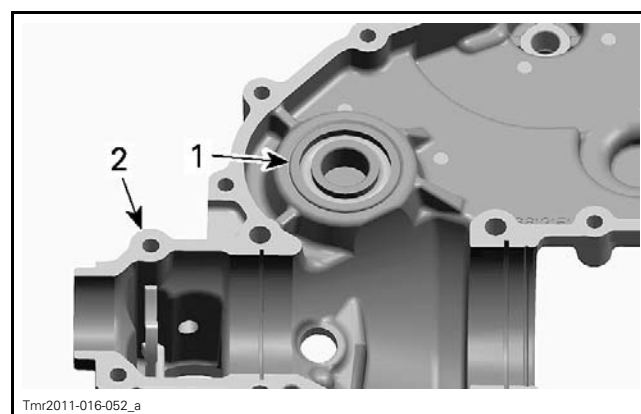
Clean oil, outside and inside, from housing before heating.

NOTICE Always support gearbox housings properly when ball bearings are removed. Housing damages may occur if this procedure is not performed correctly.

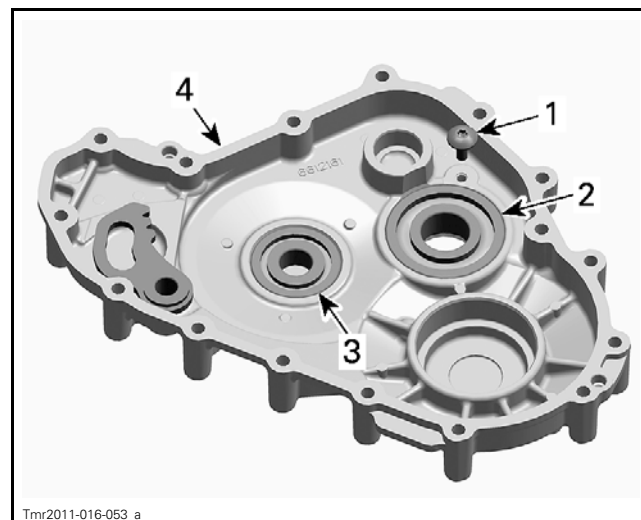
To remove ball bearings of countershaft (right cover) and main shaft (left cover) use a blind hole bearing puller.

Remove screw securing the countershaft bearing in the left cover.

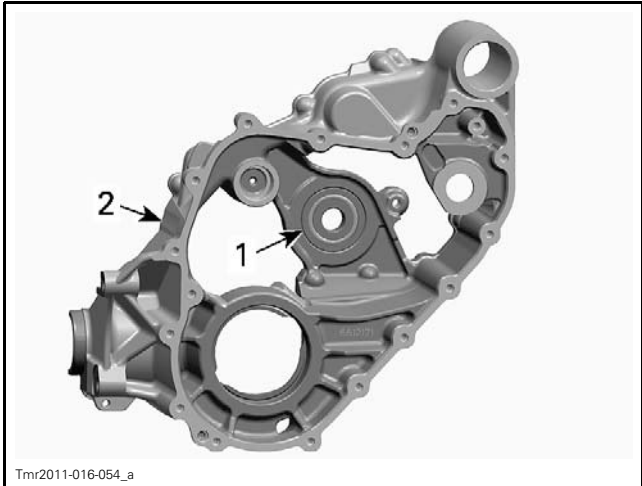
For ball bearings of countershaft (left cover) and main shaft (center housing) push with a suitable puller from outside in.



1. Ball bearing countershaft
2. Right cover



1. Screw
2. Ball bearing countershaft
3. Ball bearing main shaft
4. Left cover



1. Ball bearing main shaft
2. Center housing

Inspecting the Gearbox

Always verify for the following when inspecting gearbox components:

- Gear teeth damage
- Worn or scoured bearing surfaces
- Rounded engagement dogs and slots
- Worn shift fork engagement groove
- Worn splines on shafts and shifting sleeves.

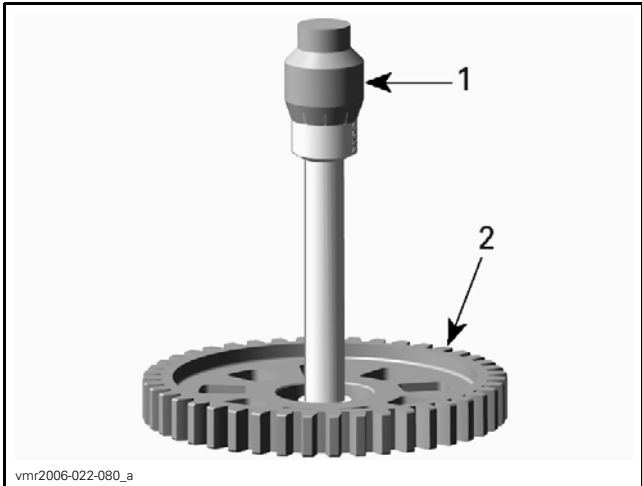
Bearings

Check if ball bearings turn freely and smoothly.
Check all bearings, bearing points, tooth flanks and taper grooves.

Free Pinions

NOTE: Always replace snap rings and use special pliers to install them.

Check free pinions for wear.

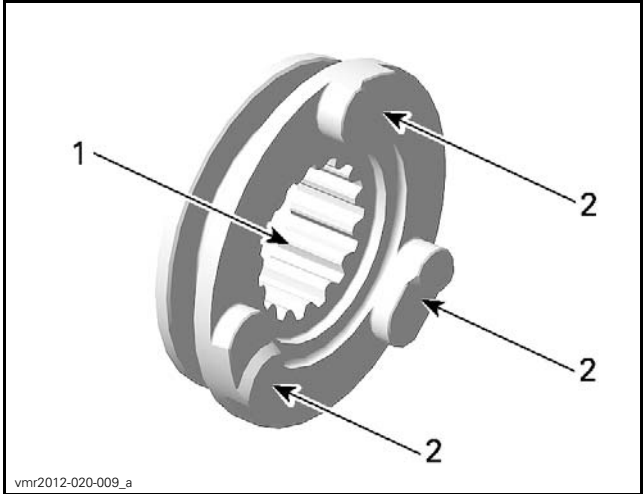


TYPICAL
1. Micrometer
2. Free pinion

DIAMETER FREE PINION	
NEW	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)
SERVICE LIMIT	29.015 mm (1.1423 in)

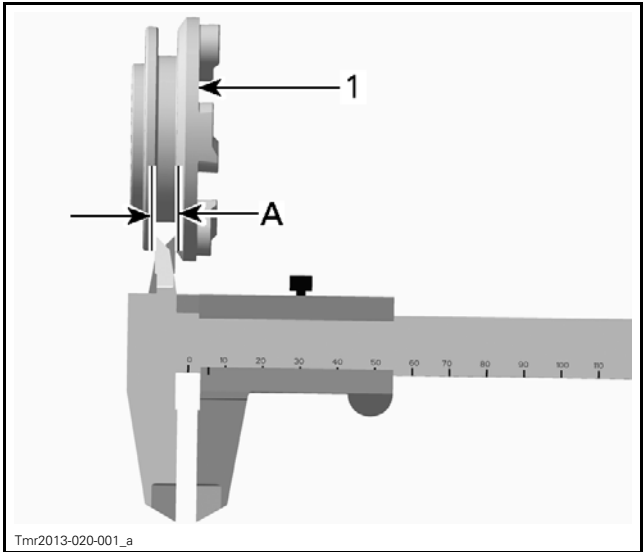
Shifting Sleeves

Check shifting sleeves for worn inner splines and rounded or damaged engagement dogs.



TYPICAL
1. Inner splines
2. Engagement dogs

Measure the width of shift fork engagement groove.

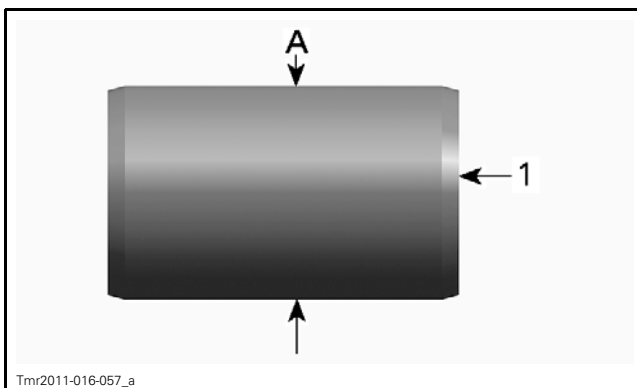


TYPICAL
1. Shifting sleeve
A. Width of shift fork engagement groove

WIDTH OF SHIFT FORK ENGAGEMENT GROOVE	
NEW	5.30 mm to 5.40 mm (.209 in to .213 in)
SERVICE LIMIT	5.50 mm (.217 in)

Shafts

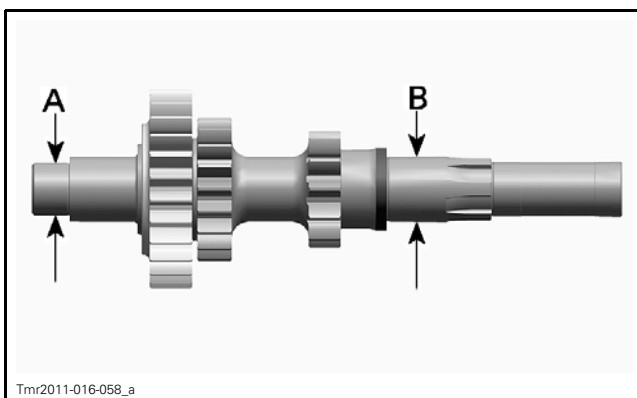
Check bearing pin of reverse intermediate gear for wear.



1. Bearing pin
A. Outer diameter

BEARING PIN OUTER DIAMETER	
NEW	24.987 mm to 25.000 mm (.984 in to .984 in)
SERVICE LIMIT	24.977 mm (.9833 in)

Check countershaft bearing journals for wear.

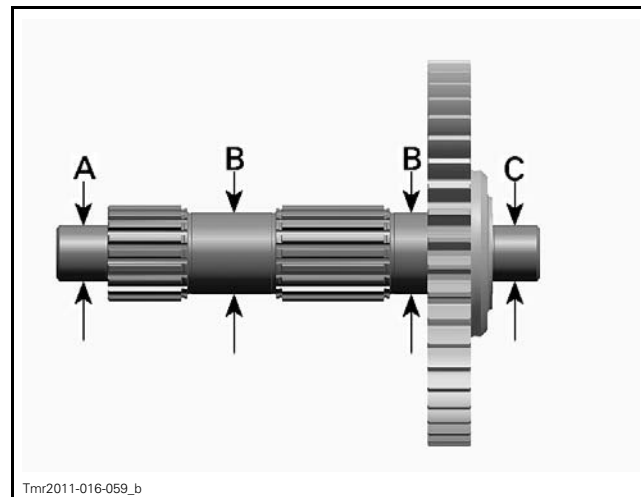


A. MAG side
B. Bearing journal CVT side

COUNTERSHAFT BEARING JOURNALS	
MAG SIDE	
NEW	19.977 mm to 19.990 mm (.786 in to .787 in)
SERVICE LIMIT	19.973 mm (.786 in)

COUNTERSHAFT BEARING JOURNALS	
MAG SIDE	
CVT SIDE	
NEW	24.977 mm to 24.990 mm (.983 in to .984 in)
SERVICE LIMIT	24.970 mm (.983 in)

Check main shaft for wear.



A. Bearing journal MAG side
B. Free pinion bearing
C. Bearing journal CVT side

MAIN SHAFT	
FREE PINION BEARING	
NEW	24.987 mm to 25.000 mm (.984 in to .984 in)
SERVICE LIMIT	24.984 mm (.984 in)
BEARING JOURNAL CVT/MAG SIDE	
NEW	16.980 mm to 16.991 mm (.669 in to .669 in)
SERVICE LIMIT	16.976 mm (.668 in)

Shift Shaft

Check shift shaft for worn splines and gears.

Check shift shaft spring for damages.

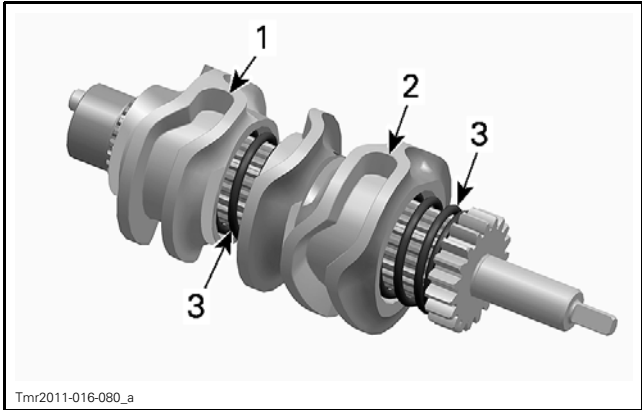
Shift Drum

NOTICE Do not disassemble shift drum.

Check if shifting gates move easily on shift drum splines and check condition of springs.

Check shift drum tracks for scouring or heavy wear, like rounded engagement slots.

Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



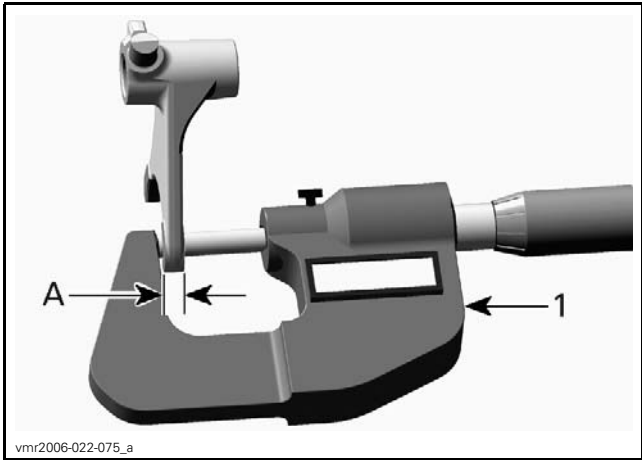
- 1. Track for the low/reverse range gear shift fork
- 2. Track for the high range gear shift fork
- 3. Springs

Shift Forks

Check both shift forks for visible damage, wear or bent shift fork claws.

Check engagement rollers for wear and smooth movement.

Measure the shift fork claw thickness.



- 1. Micrometer
- A. Shift fork claw thickness

SHIFT FORK CLAW THICKNESS	
NEW	5.10 mm to 5.20 mm (.201 in to .205 in)
SERVICE LIMIT	5.00 mm (.197 in)

Shift Fork Shaft

Check shift fork shaft for visible damage or wear.

Check if shift fork shaft is straight.

Index Lever and Parking Lever

Index lever with roller must move freely.

Check parking lever for cracks or other damages.

Output Shaft

Check output shaft and its gear for cracks, bend, pitting or other visible damages.

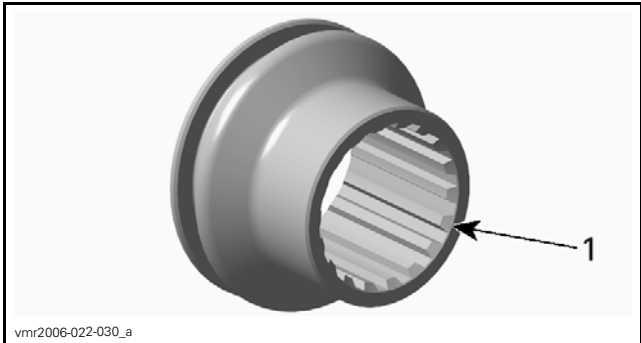
Check output shaft splines for wear or other damages.

Check if the output shaft bearings turn freely and smoothly.

Replace oil seal if brittle, hard or damaged.

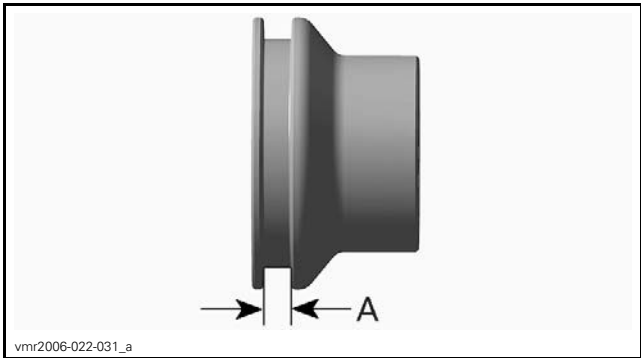
4x4 Coupling Sleeve

Check splines of coupling sleeve for wear or other damages.



- 1. Inspect splines

Measure the coupling sleeve groove width.



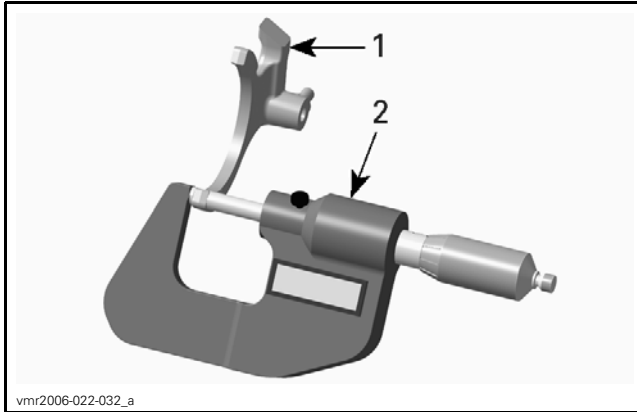
- A. Groove width

COUPLING SLEEVE GROOVE WIDTH	
NEW	5.25 mm to 5.35 mm (.207 in to .211 in)
SERVICE LIMIT	5.50 mm (.217 in)

Coupling Fork

Check coupling fork for visible damage, wear or bent coupling fork claws.

Check coupling fork claw thickness.



1. Coupling fork
2. Micrometer

COUPLING FORK CLAW THICKNESS	
NEW	4.95 mm to 5.05 mm (.195 in to .199 in)
SERVICE LIMIT	4.80 mm (.189 in)

Assembling the Gearbox

The assembly of gearbox is essentially the reverse of disassembly procedure. However, pay attention to the following details.

Gearbox Bearings

Unless otherwise instructed, never use hammer to install ball bearings. Use press machine only. If necessary heat housings up to 100°C (212°F) before installing ball bearings.

⚠ WARNING

Clean oil, outside and inside, from housing before heating.

Place new bearing in freezer for 10 minutes before installation.

Use a suitable installer for installing ball bearings of countershaft and main shaft.

NOTE: Place gearbox housings on a wood stand before installing ball bearings.

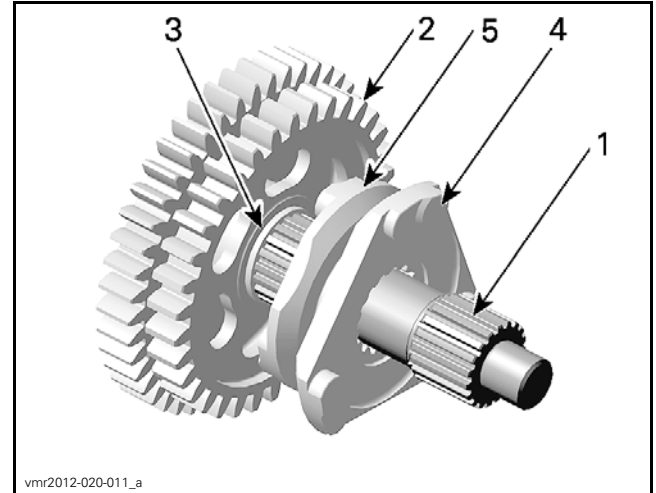
Install new oil seals with the proper installer (refer to *OIL SEALS* in this subsection).

Main Shaft and Shift Forks

Install **NEW** snap rings.

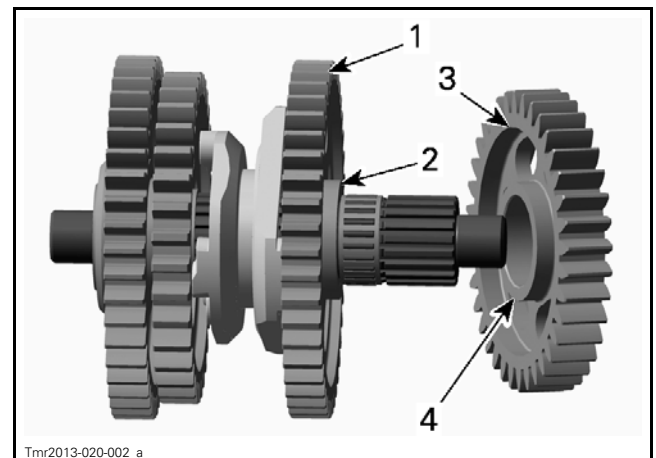
NOTE: Ensure snap rings are installed in the grooves properly.

Install free pinion (REVERSE range gear) and shifting sleeve (LOW/REVERSE range gear) properly.



1. Main shaft
2. Free pinion (REVERSE range gear)
3. Snap ring
4. Shifting sleeve (LOW/REVERSE range gear)
5. Shifting dogs (REVERSE range gear)

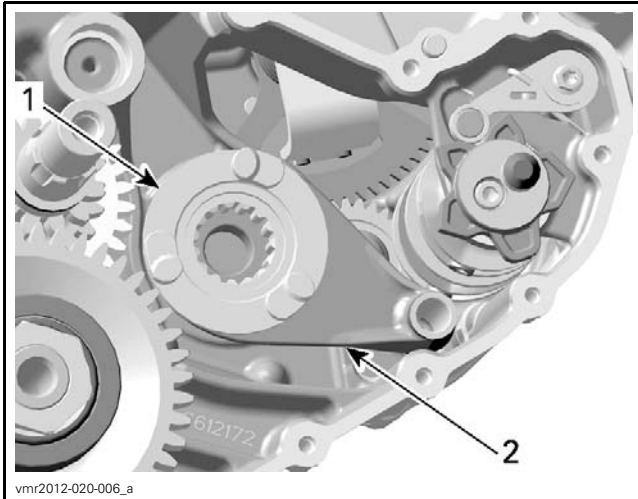
Collars of free pinion (LOW range gear) and free pinion (HIGH range gear) must point together.



1. Free pinion (LOW range gear), 44 T
2. Collar
3. Free pinion (HIGH range gear), 36 T
4. Collar

Place shifting sleeve (HIGH range gear) with shift fork in the center of on main shaft bearing in center housing.

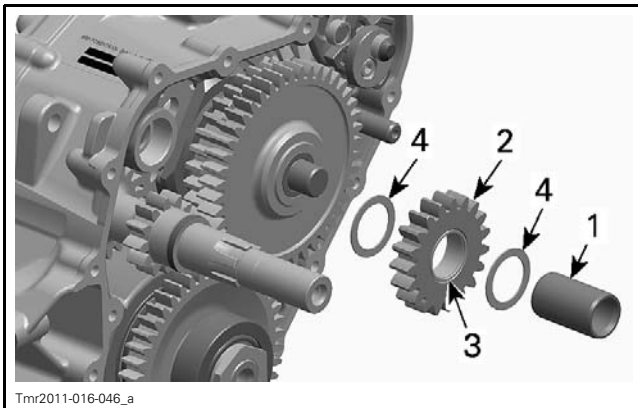
Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))



1. Shifting sleeve (HIGH range gear)
2. Shift fork

Carefully fit main shaft assembly with shift fork (LOW/REVERSE range gear) into inner splines of shifting sleeve (HIGH range gear).

Install reverse intermediate gear.



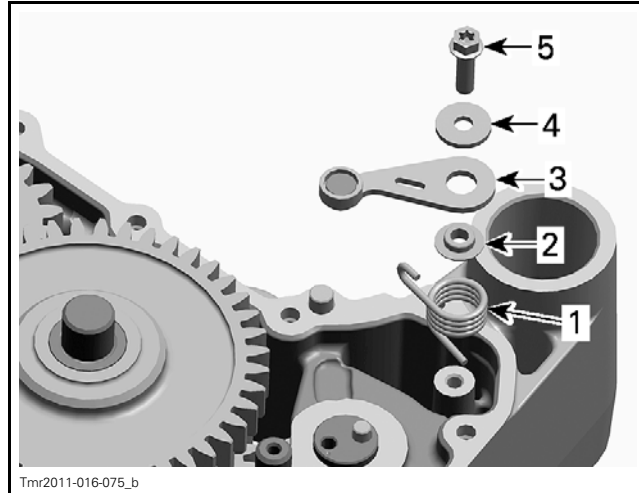
1. Bearing pin
2. Reverse intermediate gear
3. Needle bearing
4. Thrust washers

Finally engage shift forks in shift drum and install shift fork shaft.

NOTE: Run all gears as a final function check before installing left housing.

Index Lever and Index Washer

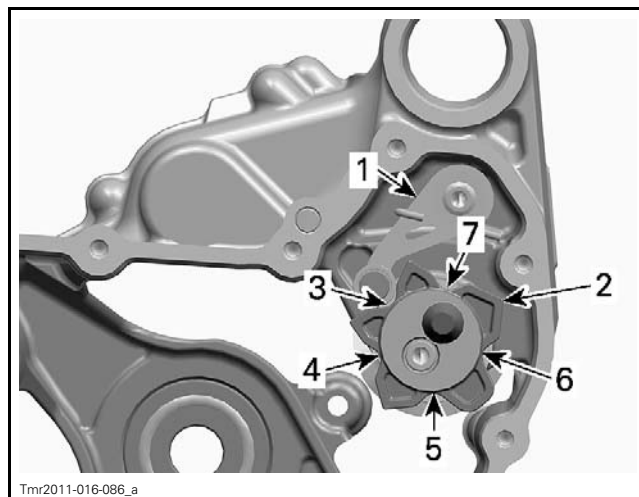
Fit step ring into index lever.



1. Index spring
2. Step ring
3. Index lever
4. Washer
5. Screw

Install index washer on shift drum.

Insert a flat screwdriver in the slot of the index lever, turn screwdriver clockwise and engage lever in index washer in NEUTRAL position as per following illustration.



1. Index lever
2. Index washer
3. Neutral position
4. High range gear position
5. Low range gear position
6. Parking position
7. Reverse range gear position

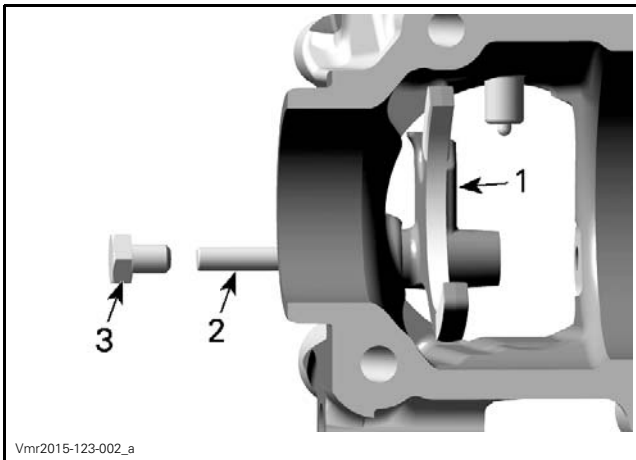
Output Shaft and 4x4 Coupling Mechanism

Install coupling sleeve onto the output shaft.

Place the output shaft with oil seal and coupling sleeve into the center housing.

NOTE: If same oil seal is installed, turn oil seal 90° offset to its original position to avoid leakage at housing mating surface.

Install coupling fork, coupling fork shaft and hexagonal screw in right cover before applying sealant to the mating surface.

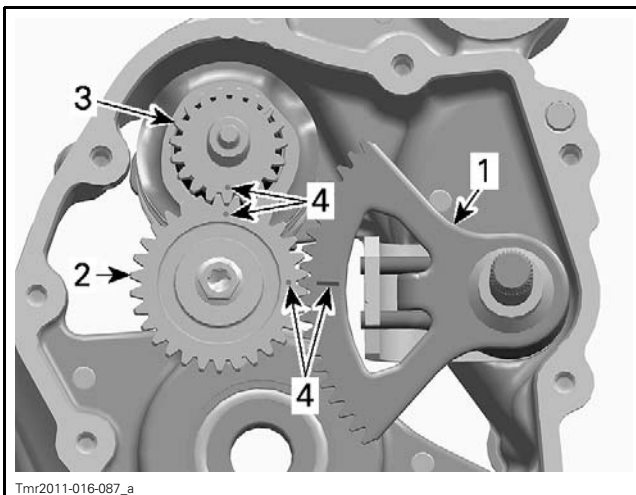


1. Coupling fork
2. Coupling fork shaft
3. Hexagonal screw

Shift Shaft and Shift Drum

Install shift drum and shift shaft.

Install shifting intermediate gear. Align its marks with the marks on shift drum gear and shift shaft.



1. Shift shaft assembly
2. Shifting intermediate gear
3. Shift drum gear
4. Marks

Engage both shift fork pins in their corresponding groove on the shift drum.

Install shift fork shaft.

NOTE: Turn gears to validate proper operation.

Sealing Compound Application

NOTE: Unless otherwise specify, the procedure to apply the sealant is the same for right or left cover.

Clean all metal components in a solvent.

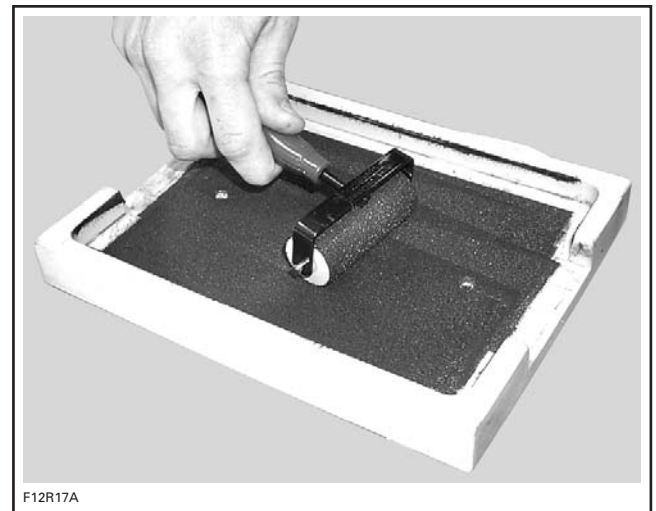
Gearbox housing mating surfaces are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE Do not wipe with rags. Use a new clean hand towel only.

IMPORTANT: When beginning the application of the gear housing sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 mm - 75 mm (2 in - 3 in)), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on gear housing mating surfaces.



Do not apply in excess as it will spread out inside gear housing.

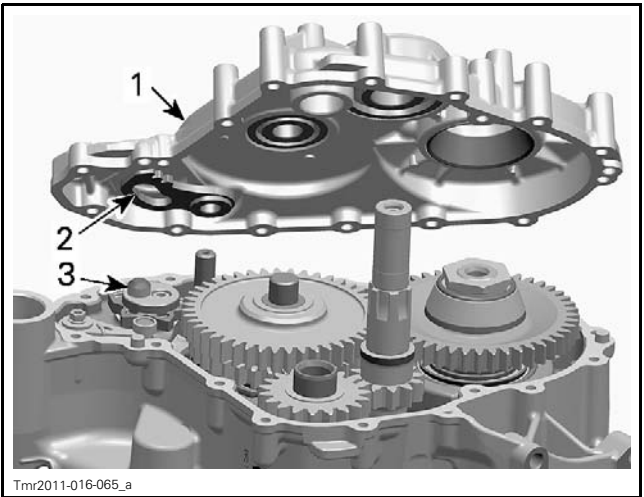
NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger will not affect the adhesion).

Left Cover

Apply sealing compound on mating surfaces of central housing. Refer to *SEALING COMPOUND APPLICATION*.

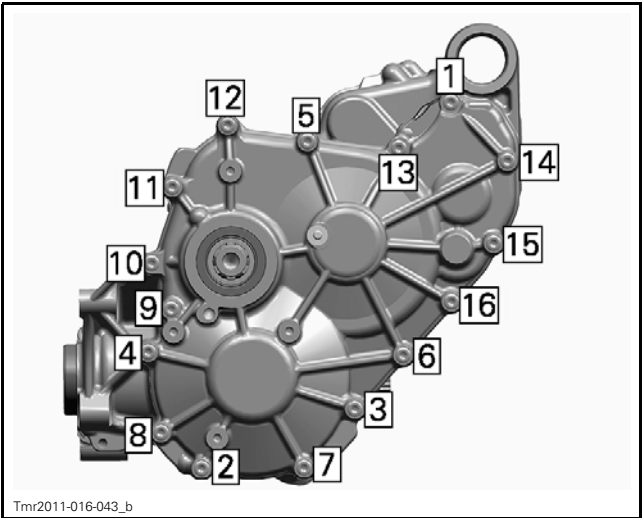
Subsection 13 (GEARBOX AND 4X4 COUPLING UNIT (WITH GBPS))

At installation of left cover, engage parking lock lever slot onto index washer pin.



- 1. Left cover
- 2. Parking lock lever slot
- 3. Index washer pin

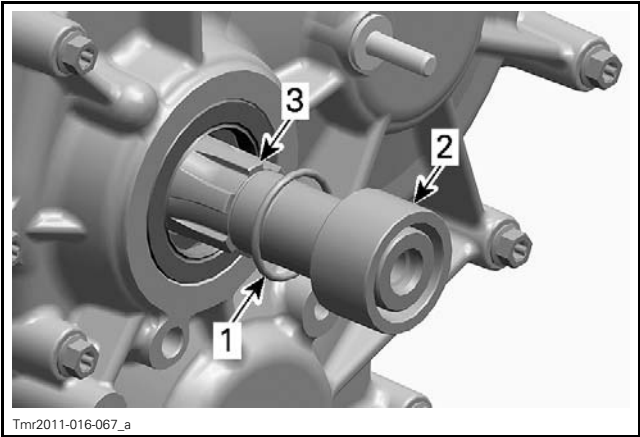
Install all screws on left cover and tighten them as per following sequence.



TIGHTENING TORQUE	
Left cover - M6 screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Install O-ring including distance sleeve on counter-shaft CVT side.

NOTICE Place O-ring including distance sleeve right away. Chamfered bore of distance sleeve has to face the gearbox.



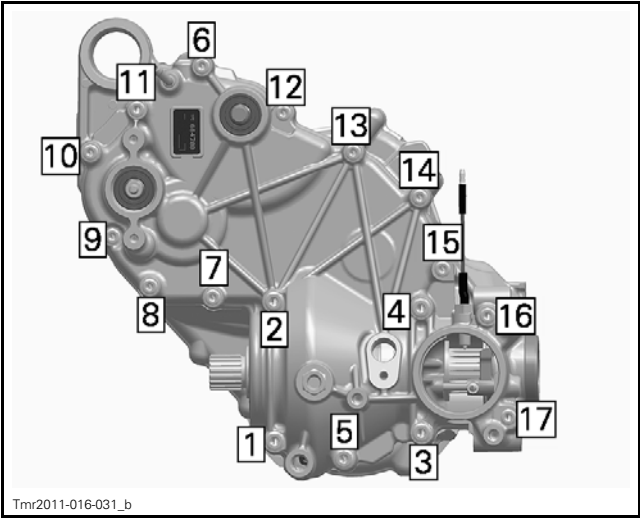
COUNTERSHAFT END CVT SIDE
1. O-ring
2. Distance sleeve
3. Countershaft end CVT side

Right Cover

Apply sealing compound on mating surfaces of central housing. Refer to *SEALING COMPOUND APPLICATION*.

To install the right cover align the coupling fork with the groove in the coupling sleeve.

Install all screws on right cover and tighten them as per following sequence.



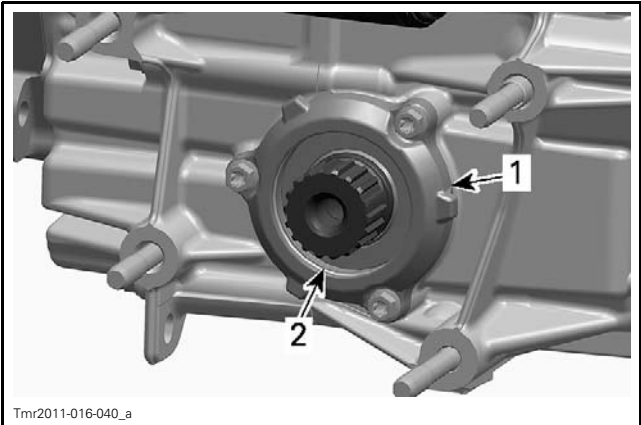
TIGHTENING TORQUE	
Right cover - M6 screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)
Right cover - M8 screws	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

Install the actuator, refer to *ACTUATOR*.

Installing the Gearbox

For installation reverse the removal procedure. Pay attention to following.

Before gearbox installation check O-ring in bearing cover if brittle, hard or damaged. Replace if necessary.



- 1. Bearing cover
- 2. O-ring

Tighten the four (4) nuts that attach the gearbox to the engine.

TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
Gearbox retaining nuts	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

After installation, refill gearbox oil. Refer to *PERIODIC MAINTENANCE PROCEDURES*.