ProGator® Utility Vehicle 2020 and 2030

TECHNICAL MANUAL

John Deere
Worldwide Commercial and Consumer Equipment Division

TM1759 (26Jan00)

Litho in U.S.A

MP21518

ProGator Utility Vehicle

This technical manual is written for an experienced technician and contains sections that are specifically for this product. It is a part of a total product support program.

The manual is organized so that all the information on a particular system is kept together. The order of grouping is as follows:

- Table of Contents
- General Diagnostic Information
- Specifications
- Electrical Wiring Harness Legend
- Component Location
- System Schematic
- Wiring Harness
- Troubleshooting Chart
- Theory of Operation
- Diagnostics
- Tests & Adjustments
- Repair

Note: Depending on the particular section or system being covered, not all of the above groups may be used.

Each section will be identified with a symbol rather than a number. The groups and pages within a section will be consecutively numbered.

We appreciate your input on this manual. To help, there are postage paid post cards included at the back. If you find any errors or want to comment on the layout of the manual please fill out one of the cards and mail it back to us.

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Horicon, WI
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Safety

Specifications and Information

Engine—Gasoline

Engine—Diesel

Electrical

Power Train

Steering

Hydraulics

Brakes

Miscellaneous M

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RECOGNIZE SAFETY INFORMATION

This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

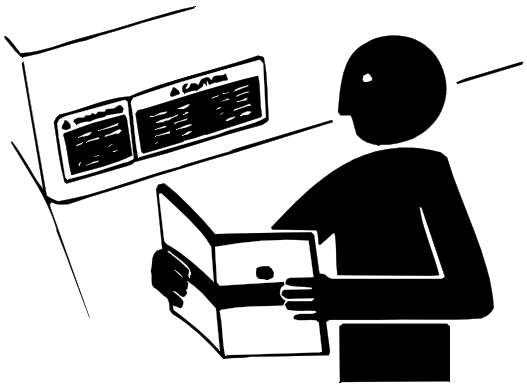
Follow recommended precautions and safe servicing practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

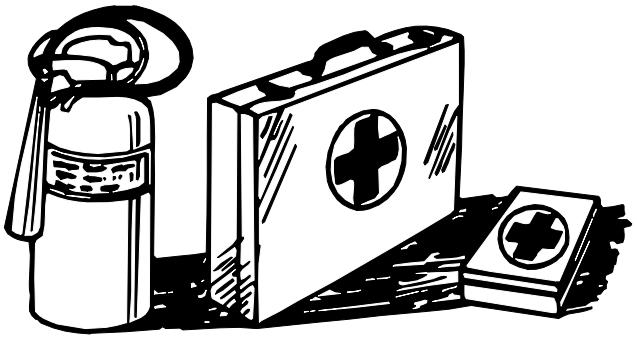
REPLACE SAFETY SIGNS



Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY-AVOID FIRES

Be Prepared For Emergencies



When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

USE CARE IN HANDLING AND SERVICING BATTERIES

Prevent Battery Explosions

- Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.
- Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.
- Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

Prevent Acid Burns

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

- **Avoid acid burns by:**

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

- **If you spill acid on yourself:**

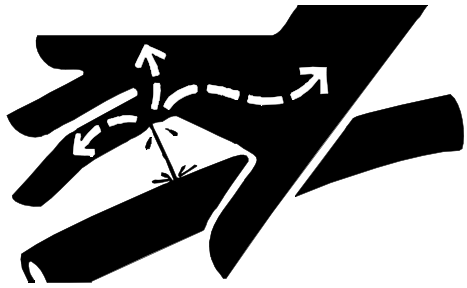
1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10_15 minutes.
4. Get medical attention immediately.

- **If acid is swallowed:**

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.

USE CARE AROUND HIGH-PRESSURE FLUID LINES

Avoid High-pressure Fluids



Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid injury from escaping fluid under pressure by stopping the engine and relieving pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.

THEORY OF OPERATION

TRANSAXLE

FUNCTION:

The transaxle consists of a five forward speed and one reverse speed transmission. The output shaft of the transmission is the pinion shaft of the differential. Power goes through the pinion shaft and ring gear, through the bevel gears to the axles and wheels.

THEORY:

Primary Drive:

The transaxle is a synchronized five speed manual shift transaxle with reverse.

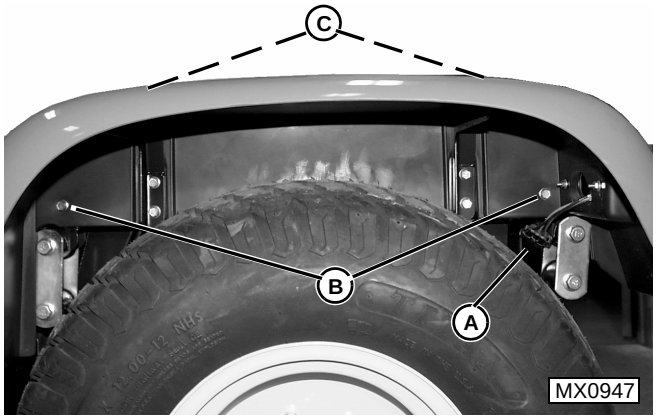
The higher the number of the gear selected the faster the ground speed of the vehicle. The low speeds provide precise ground speeds for use with implements. Neutral allows the ground drive gear train to be disengaged from the engine and still allow use of the PTO to operate implements without the danger of vehicle movement. Reverse allows movement of the vehicle in the reverse direction.

Once the shift lever has been moved from the neutral position to gear selection, power goes through the selected gear, pinion shaft to the rear differential and axles to the rear wheels. If equipped with four wheel drive, through the bi-directional clutch, front wheel drive shaft, to the front wheel drive differential and front wheels. The bi-directional clutch automatically transmits power to the front differential only when a difference in front and rear wheel speed is detected.

A rear differential lock is also provided to maximize rear wheel traction. When the rear differential lock is engaged it locks the spider gears in the rear differential carrier causing both rear wheels to turn simultaneously regardless of traction conditions. The differential lock should only be used under extreme conditions as it can impair steering.

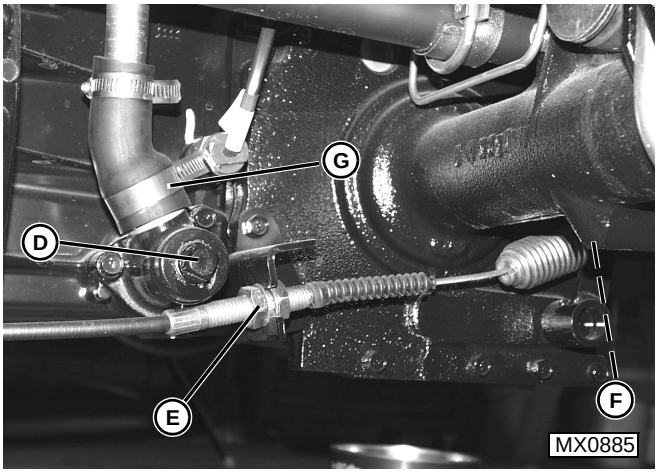
REPAIR

TRANSAXLE REMOVAL AND INSTALLATION

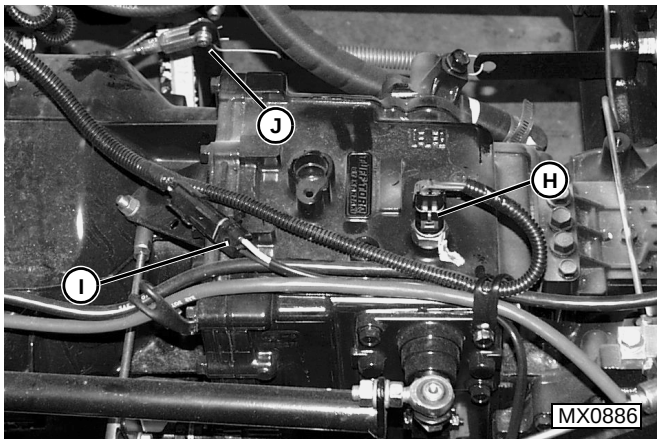


NOTE: The rear frame of the machine will have to be lifted to clear transaxle as it is rolled out. Park machine where it will be accessible to a lift.

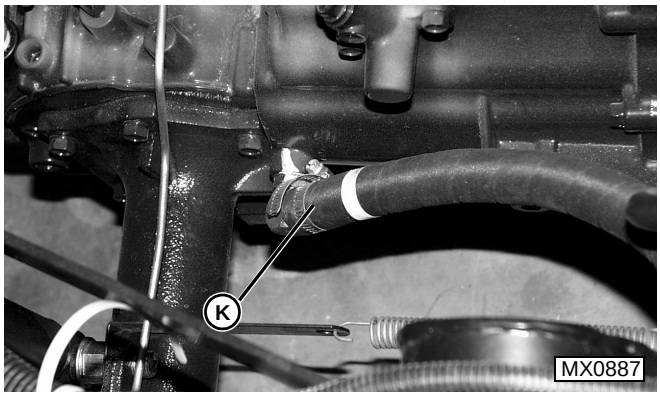
1. Safely park machine.
2. Disconnect tail light plug (A), remove cap screws (B), and hex head screws (C), from top of rear fenders.
3. Remove rear fenders.



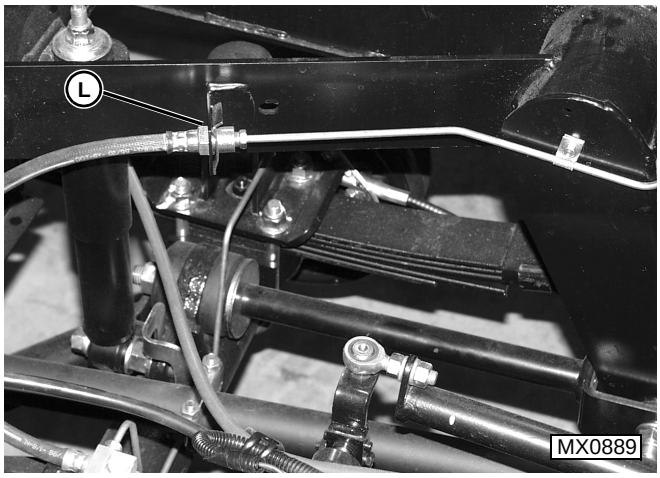
4. Remove plug (D) and drain oil from transaxle.
5. Loosen nuts (E) on differential lock cable and pull cable away from bracket. Disconnect spring (F) from lever.
6. Disconnect hydraulic oil suction line (G).



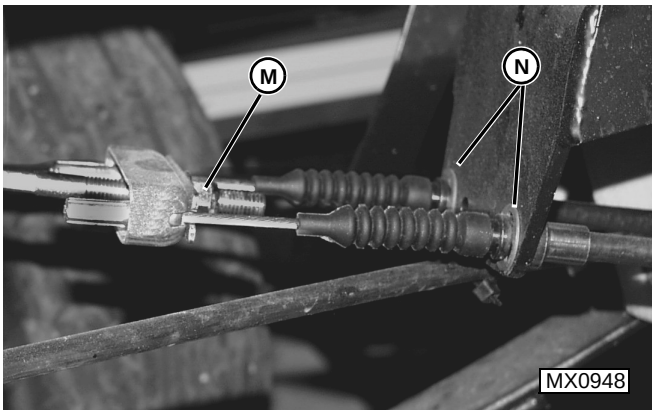
7. Disconnect neutral switch (H) and speedometer sensor (I).
8. Disconnect clutch cable yoke (J) from lever.



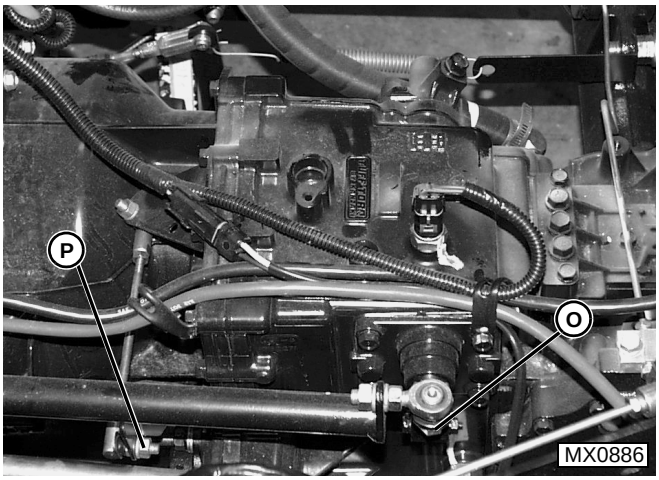
9. Remove hydraulic pump return line (K).



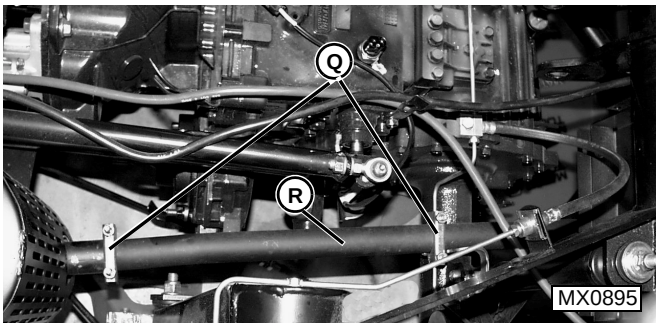
10. Disconnect brake hose (L) and cap ends.



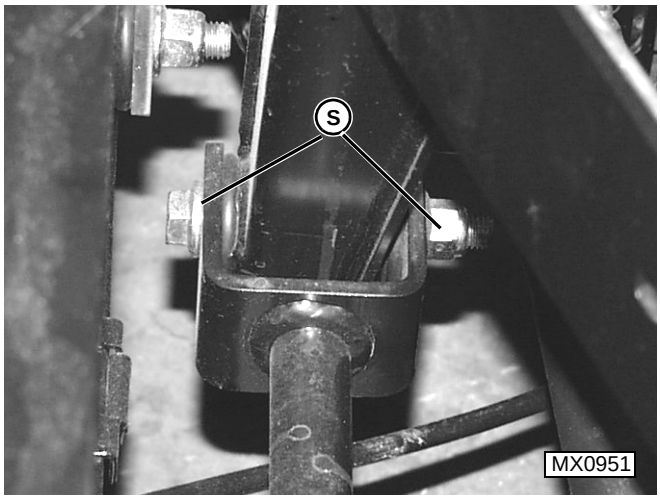
11. Loosen nut (M), remove clips (N), and remove park brake cables from balancer and bracket.



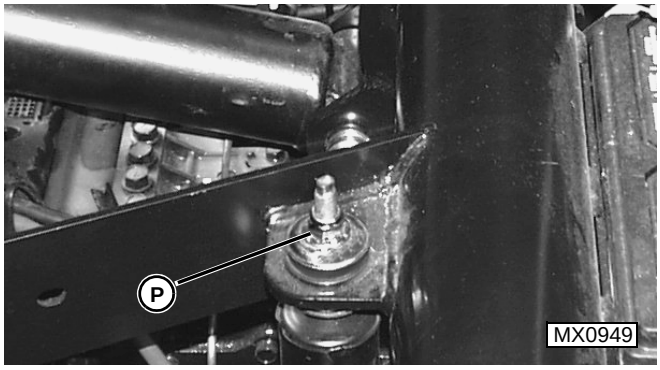
12. Disconnect shifter tube (O) from lever on transmission. Remove rod (P) from reaction link.



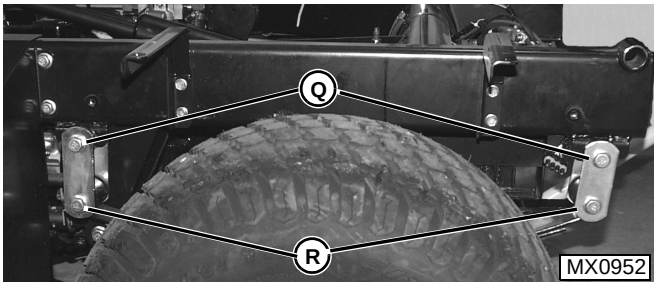
13. Remove clamps (Q) and tailpipe (R).



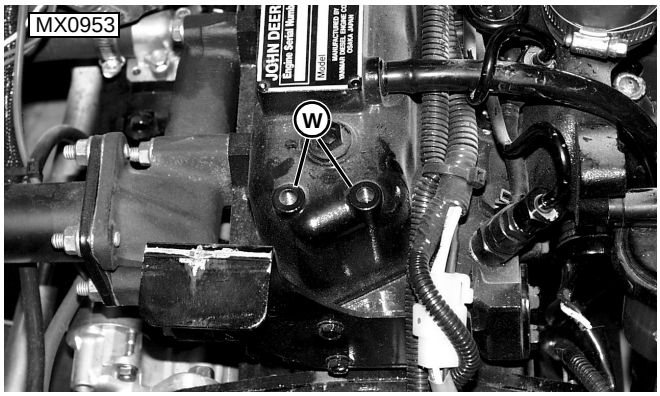
14. Remove cap screws and nuts (S) from front of torque arms.



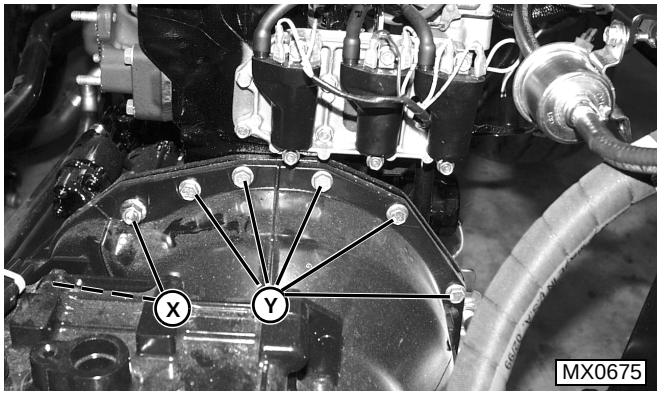
15. Remove nuts (P), from upper shock mounts and push shocks down to clear frame.
16. Support vehicle frame.



17. Remove cap screws (Q) from top of spring shackles, and loosen bottom cap screws (R).



18. A support for rear of engine can be fabricated by using a piece of angle iron. Cut angle iron long enough to rest across frame rails, then drill holes in angle iron to match threaded holes in rear of valve cover (W). Install cap screws to support engine.

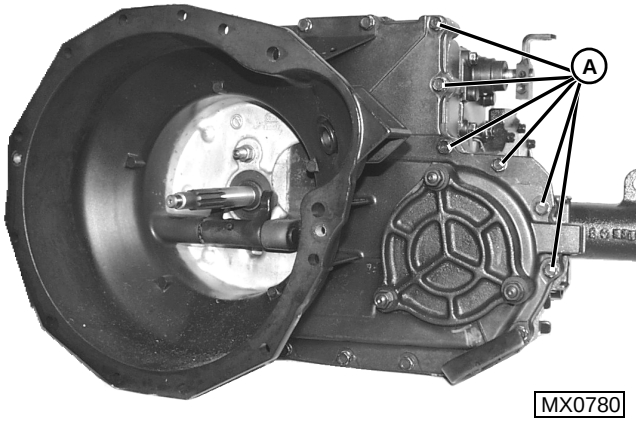


19. Place floor jack under clutch housing to support front of transaxle.
20. Remove nuts from starter mounting cap screws (X) and total of 11 clutch housing cap screws (Y).
21. Roll transaxle back from engine until input shaft is clear of clutch.
22. Raise rear of machine and remove transaxle.

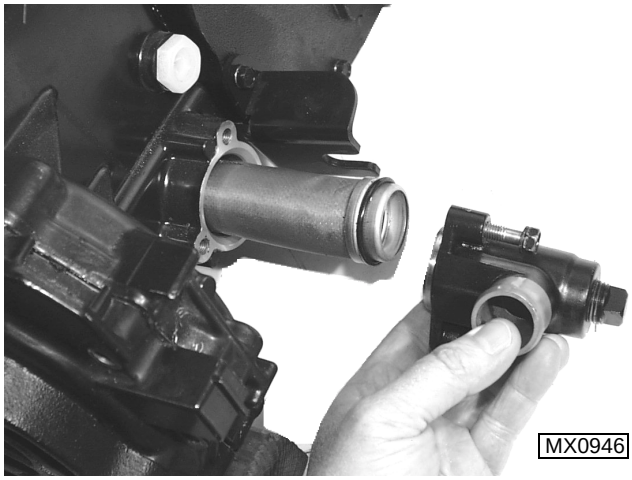
Installation:

1. Install transaxle in the reverse order of removal.
2. If clutch has been disturbed, check alignment with JDG1331 clutch alignment tool before installing transaxle.
3. Tighten clutch housing cap screws to **23-29 N•m (17-22 lb-ft).**
4. Tighten spring shackle cap screws to **103-132 N•m (76-98 lb-ft).**
5. After installing brake line, bleed brakes and fill master cylinder reservoir with approved DOT 3 brake fluid.
6. Fill transmission with oil until oil reaches "full" mark on dipstick.

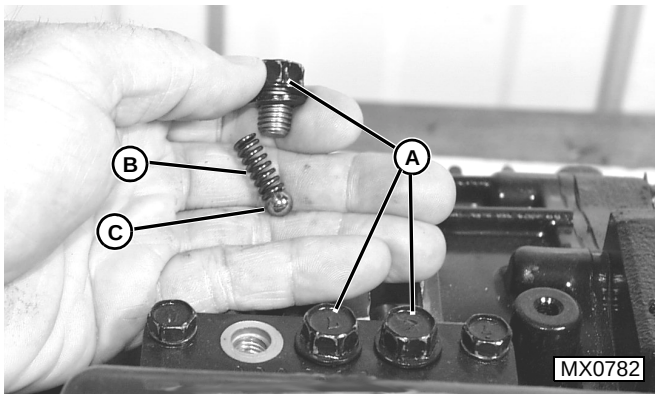
TRANSAXLE DISASSEMBLY



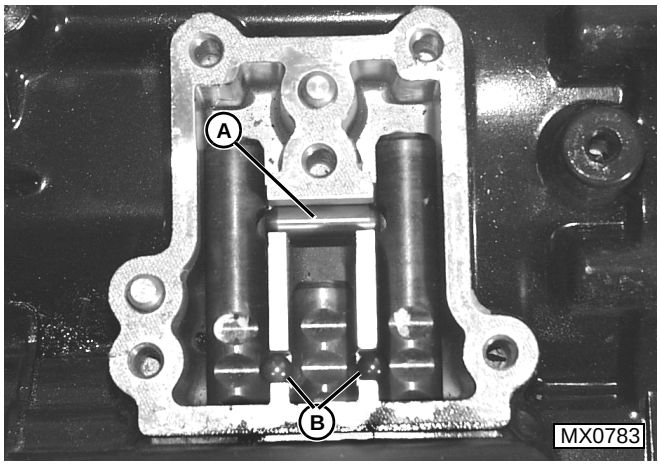
1. Remove cap screws (A) (total of 20) securing clutch housing to transaxle case.



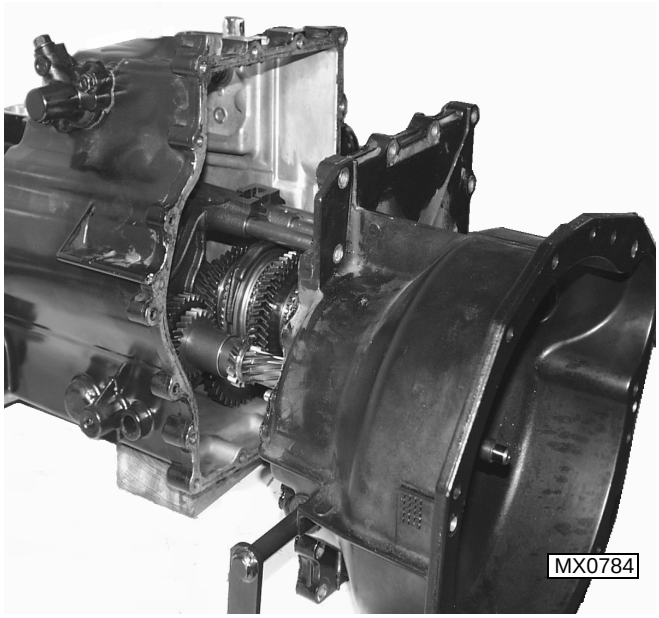
2. Remove elbow and screen.



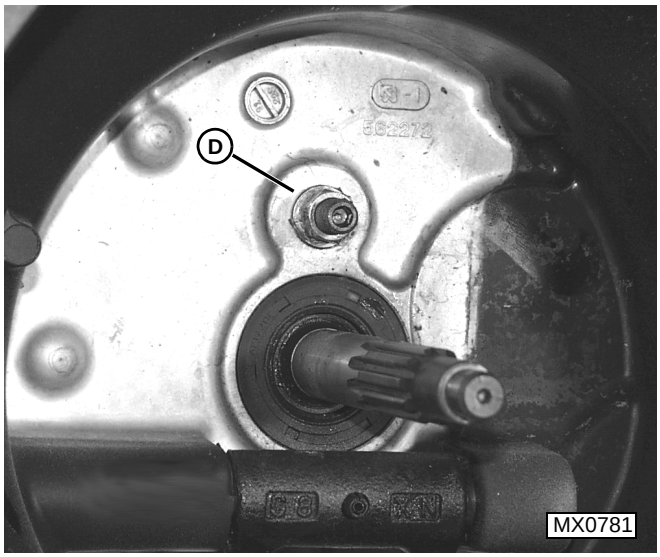
3. Remove three cap screws (A) from shaft cover.
4. With a magnet, remove springs (B), and balls (C).
5. Remove shaft cover.



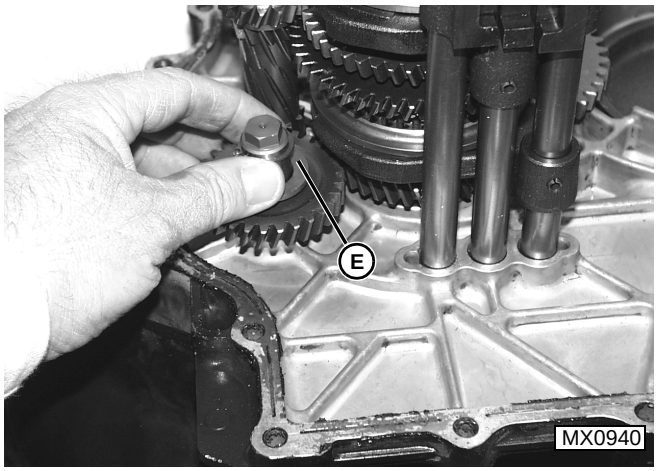
6. Remove pin (A) and balls (B) from shift shafts.



7. Remove clutch cover and all transmission components as an assembly.

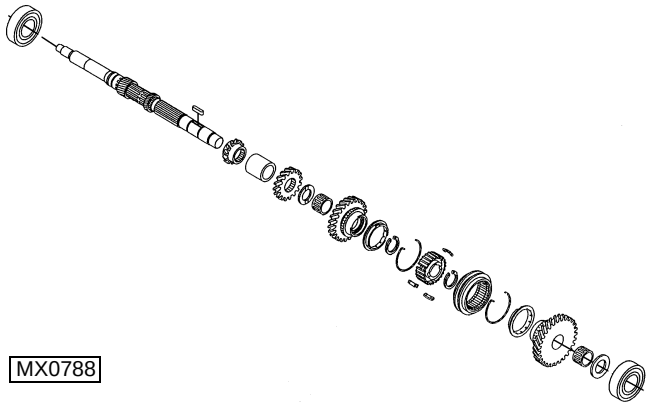


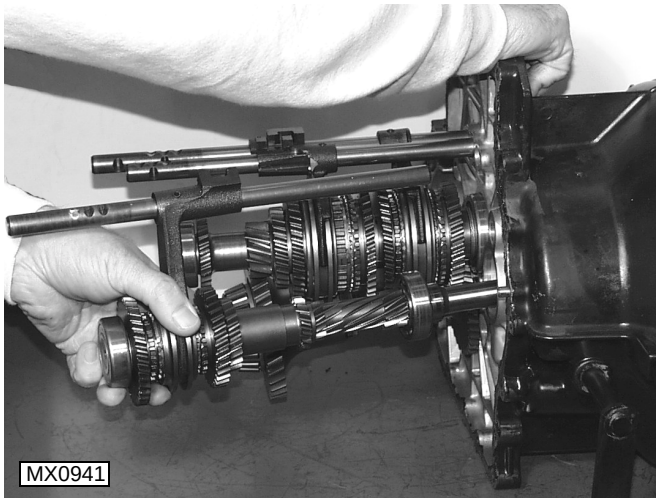
8. Remove nut (D).



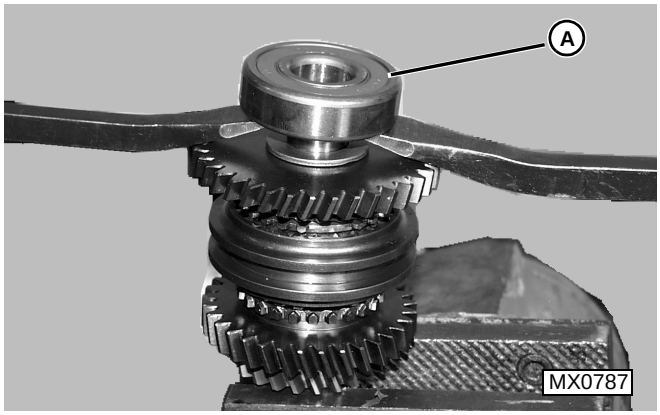
9. Remove reverse idler gear and shaft (E).

INPUT SHAFT DISASSEMBLY AND ASSEMBLY



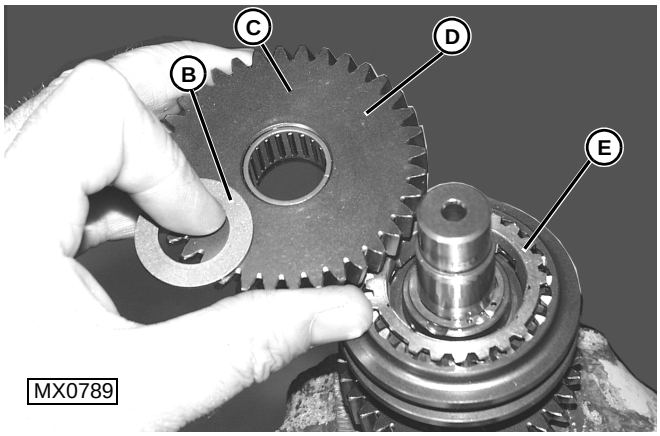


10. Simultaneously pull all three shafts out just enough that input shaft can be removed.



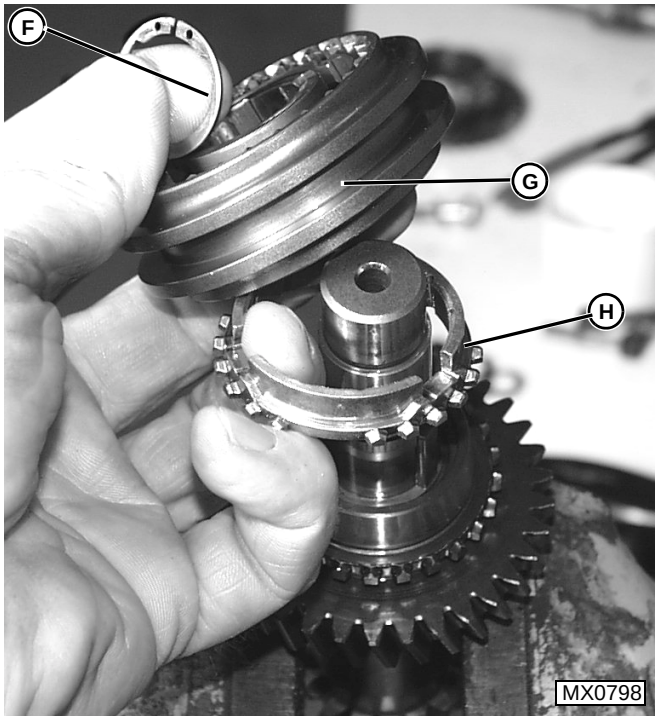
1. Remove bearing from end of shaft.

NOTE: Bearing (A) is sealed only on one side. Sealed side must face away from gear as shown when reassembled.

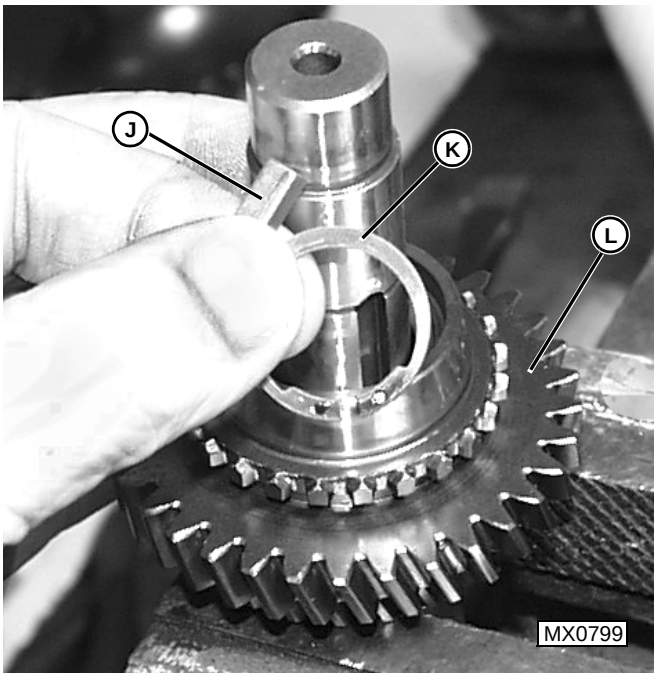


2. Remove washer (B), gear (C), bearing (D), and synchronizer (E).

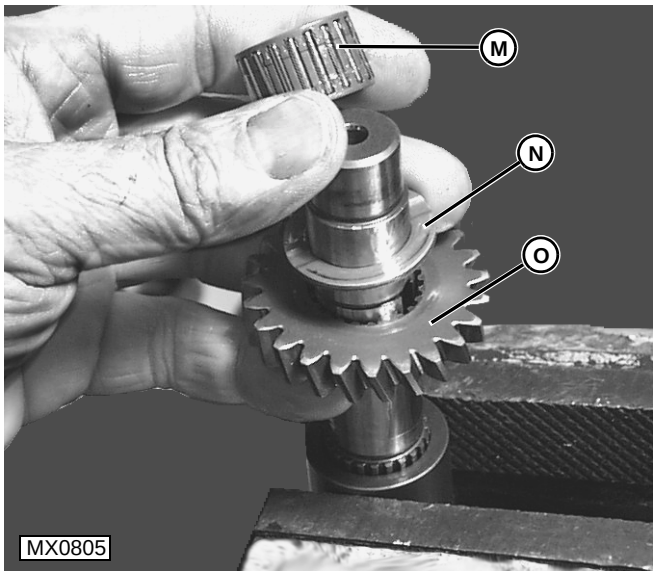
NOTE: Oil grooves in washer (B) face toward gear.



3. Remove snap ring (F), sliding clutch (G) and bottom synchronizer (H).

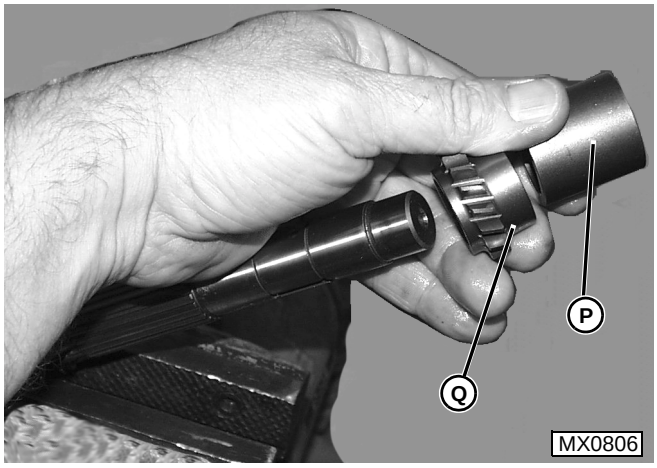


4. Remove shaft key (J), snap ring (K), and gear (L).

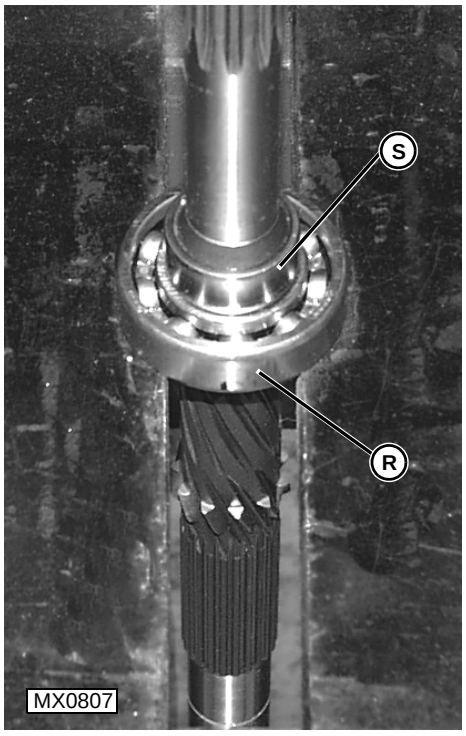


5. Remove bearing (M), washer (N), and gear (O), from the shaft.

NOTE: Oil grooves in washer (N) face up as shown.



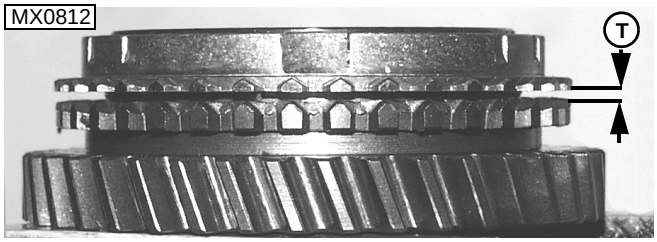
6. Remove spacer (P), and gear (Q).



7. Press off bearing (R), and seal sleeve (S).

NOTE: If seal sleeve (S) is removed, it must be replaced with a new one.

8. Clean all parts and inspect for wear or damage.



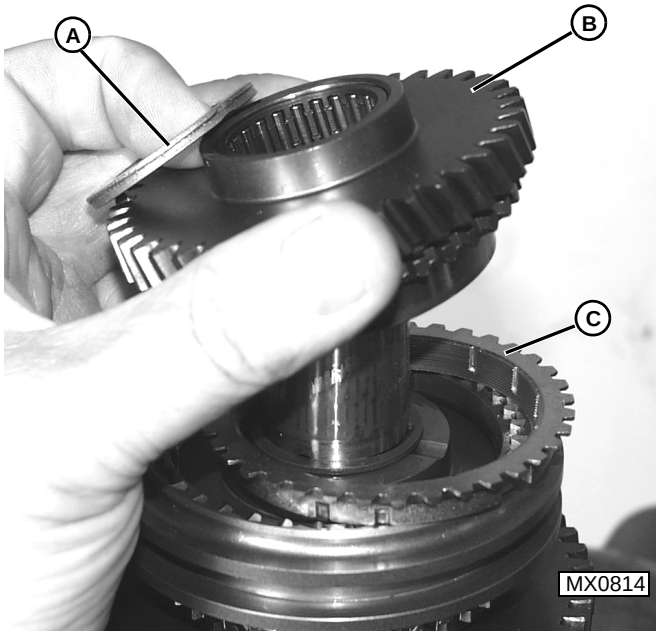
9. Check gap (T) between synchronizer and gear. As synchronizer wears, gap gets smaller. When synchronizer has worn enough that the gap is only **0.1mm (0.004 in.)** or the synchronizer is touching the gear, replace synchronizer. Check for any damage on synchronizer teeth and gear teeth. Replace parts as needed.

Assembly:

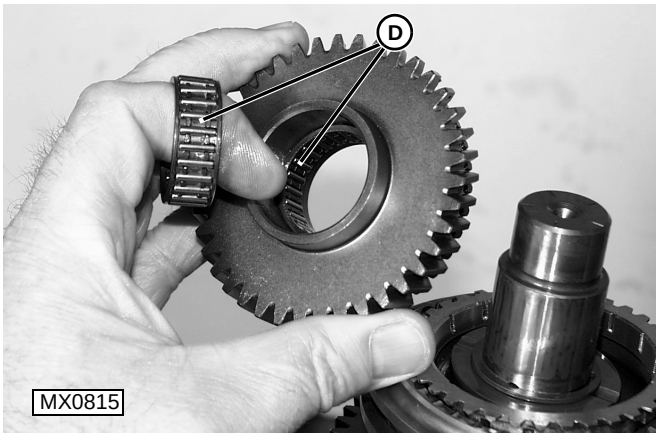
Assemble in the reverse order of disassembly.

REDUCTION SHAFT DISASSEMBLY AND ASSEMBLY

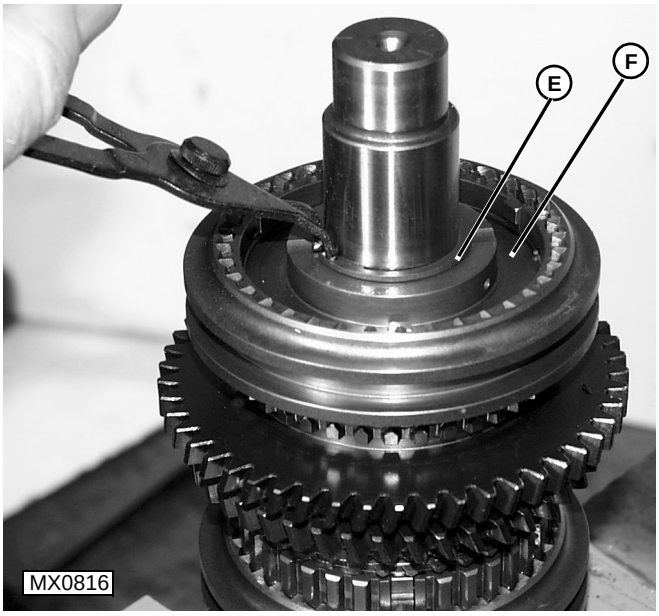
1. Use a press or two small pry bars and remove bearing from shaft.



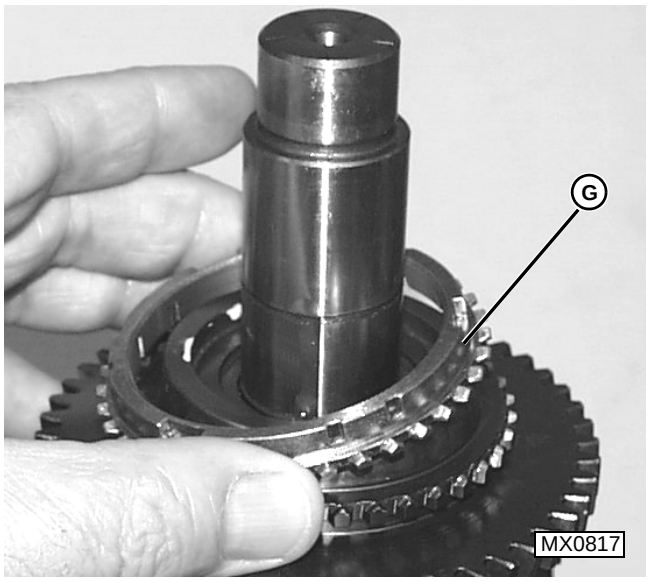
2. Remove washer (A), 39T gear (B), and synchronizer (C).



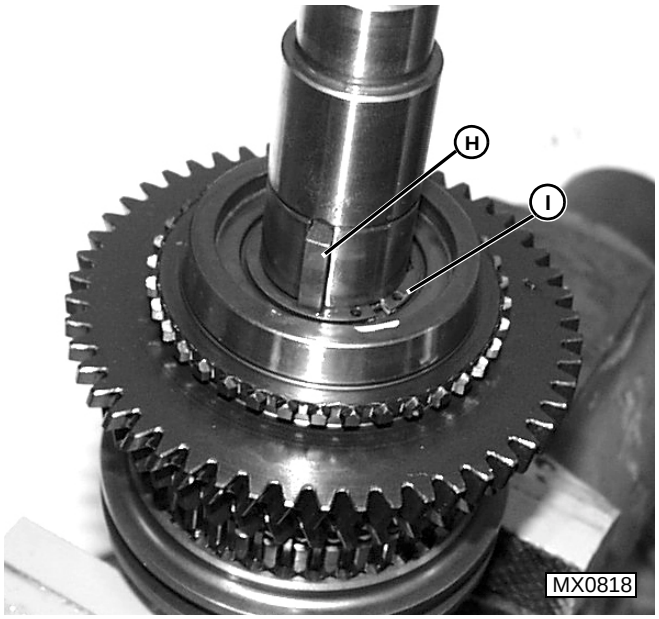
3. Remove bearings (D). Check bearings and inner bore of gear for wear/damage.



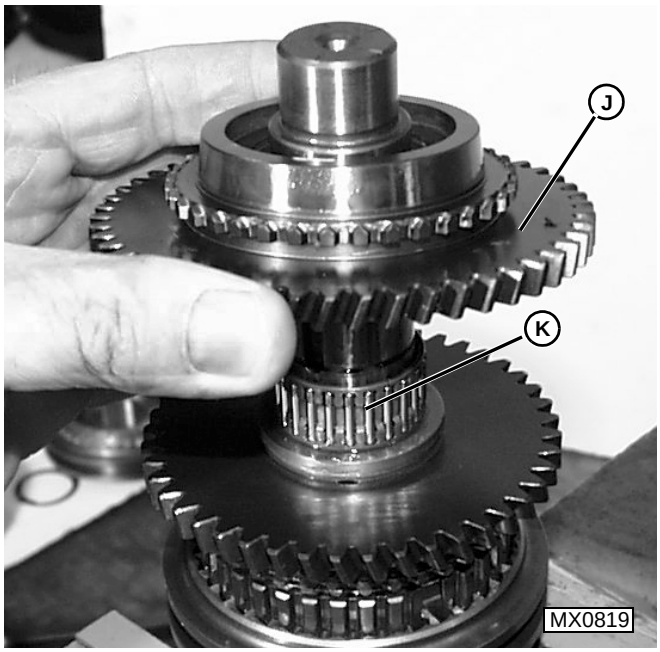
4. Remove snap ring (E), and sliding clutch (F).



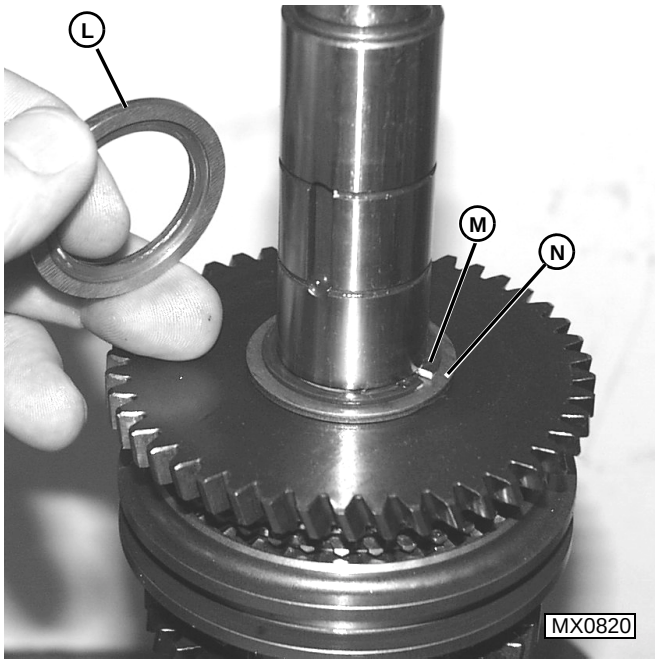
5. Remove synchronizer (G).



6. Remove key (H), and snap ring (I).

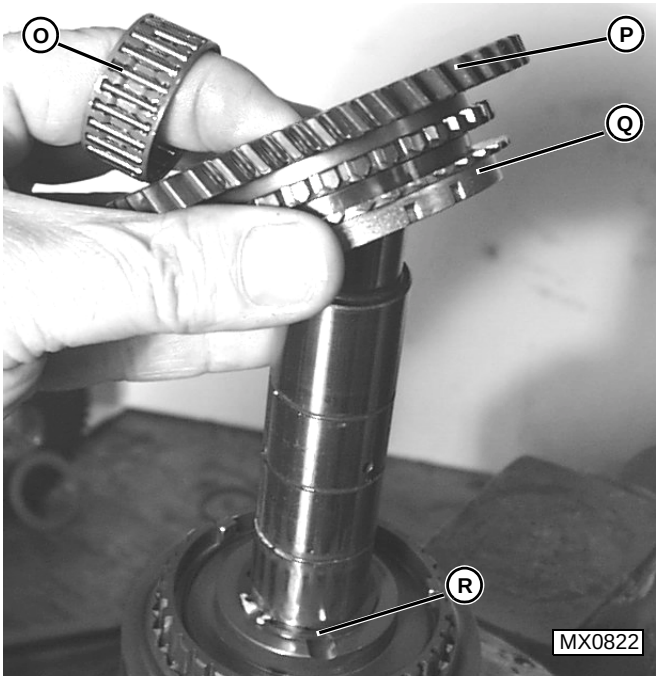


7. Remove 50T gear (J) and bearing (K) from shaft.

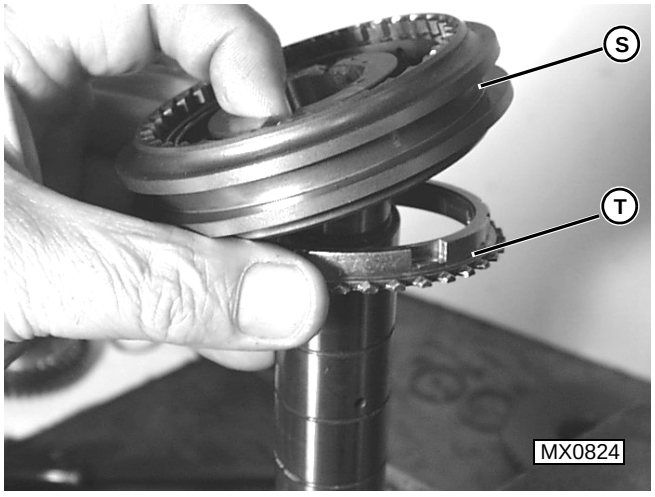


8. Remove washer (L), snap ring (M), and washer (N).

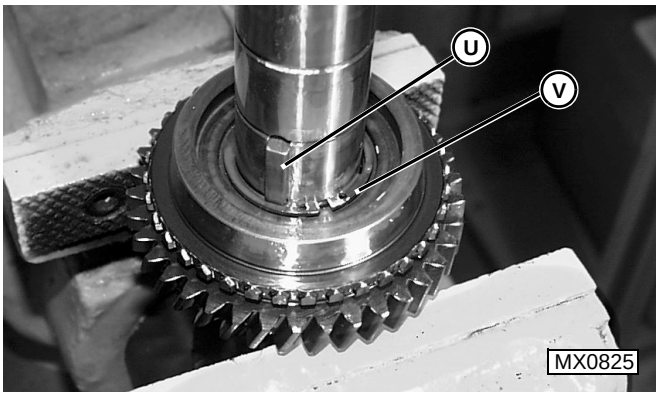
NOTE: Note that groove in washer (L) goes toward snap ring (M).



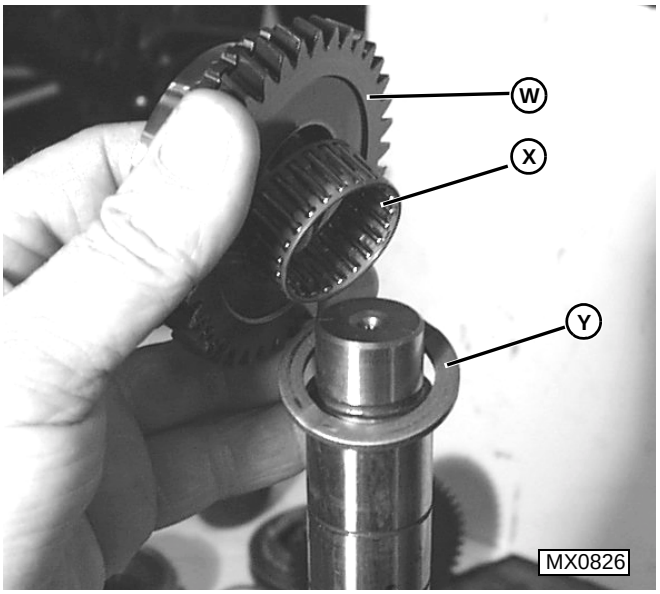
9. Remove bearing (O), 44T gear (P), and synchronizer (Q).
10. Remove snap ring (R).



11. Remove sliding clutch (S), and synchronizer (T).

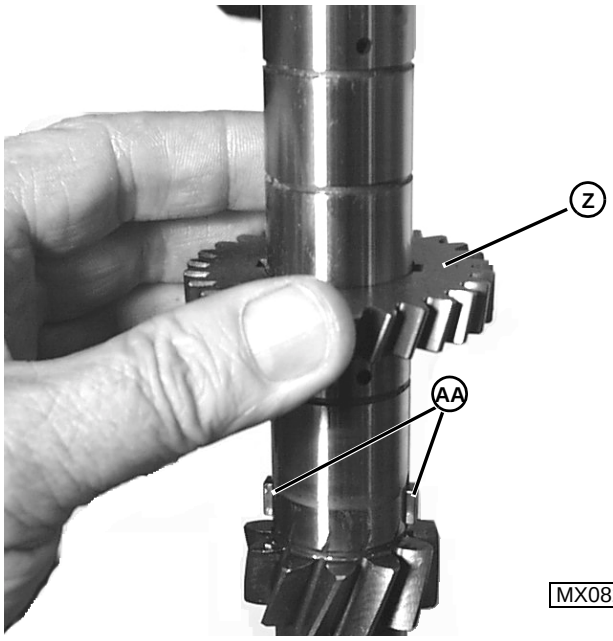


12. Remove key (U), and snap ring (V).

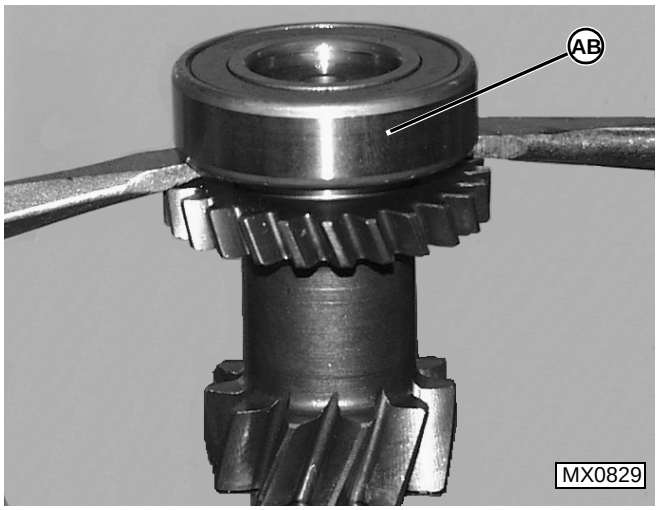


13. Remove 27T gear (W), bearing (X), and washer (Y).

NOTE: Note that oil grooves on washer (Y) face gear (W).



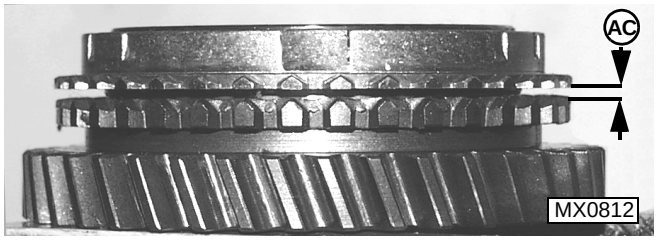
14. Remove 28T gear (Z), and keys (AA).



15. Remove bearing (AB) from shaft.

NOTE: Note that sealed end of bearing faces away from gear.

16. Clean all parts and inspect for wear or damage.

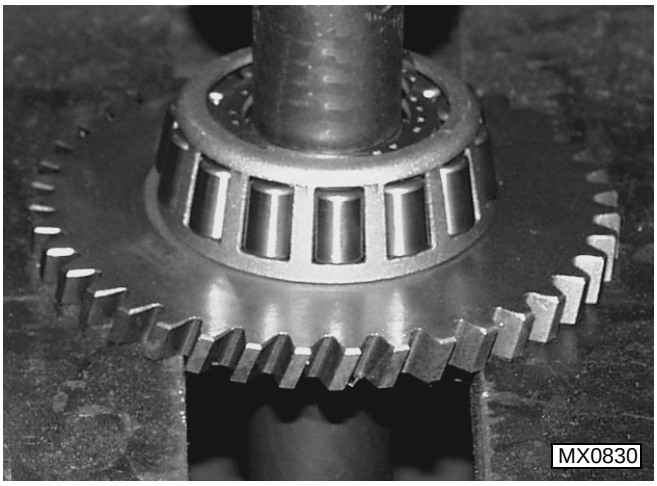


17. Check gap (AC) between synchronizer and gear. As synchronizer wears, gap gets smaller. When synchronizer has worn enough that the gap is only **0.1mm (0.004 in.)** or the synchronizer is touching the gear, replace synchronizer. Check for any damage on synchronizer teeth and gear teeth. Replace parts as needed..

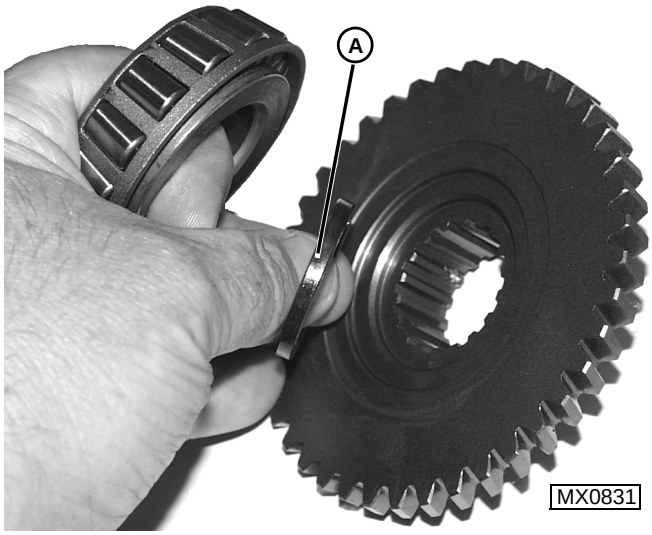
Assembly:

Assemble in the reverse order of disassembly.

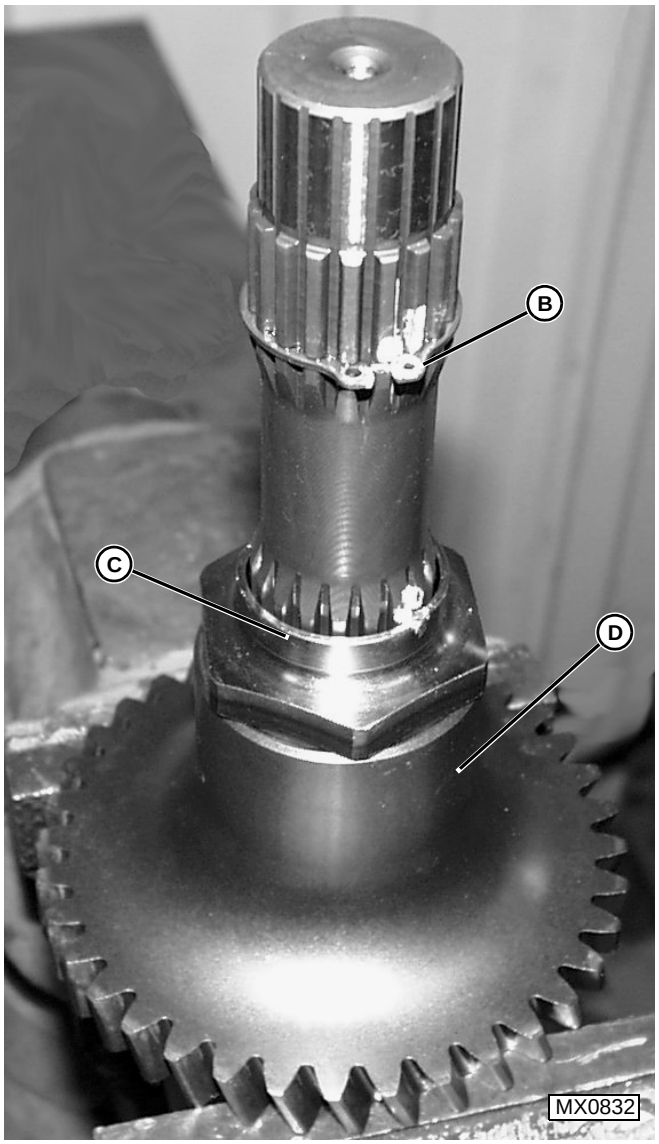
COUNTERSHAFT DISASSEMBLY AND ASSEMBLY



1. Press bearing and 40T gear from countershaft.



NOTE: Note position of spacer (A) between bearing and gear.

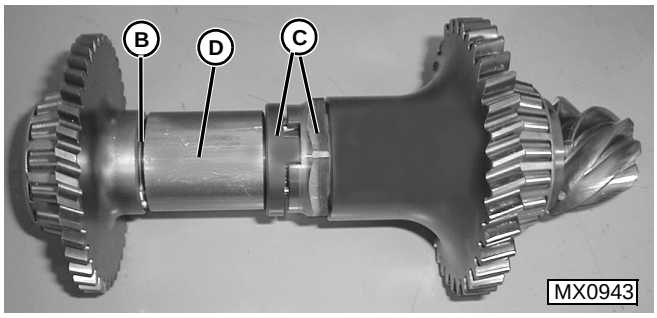


NOTE: Early production model as shown above have locknut (C) staked to splines.

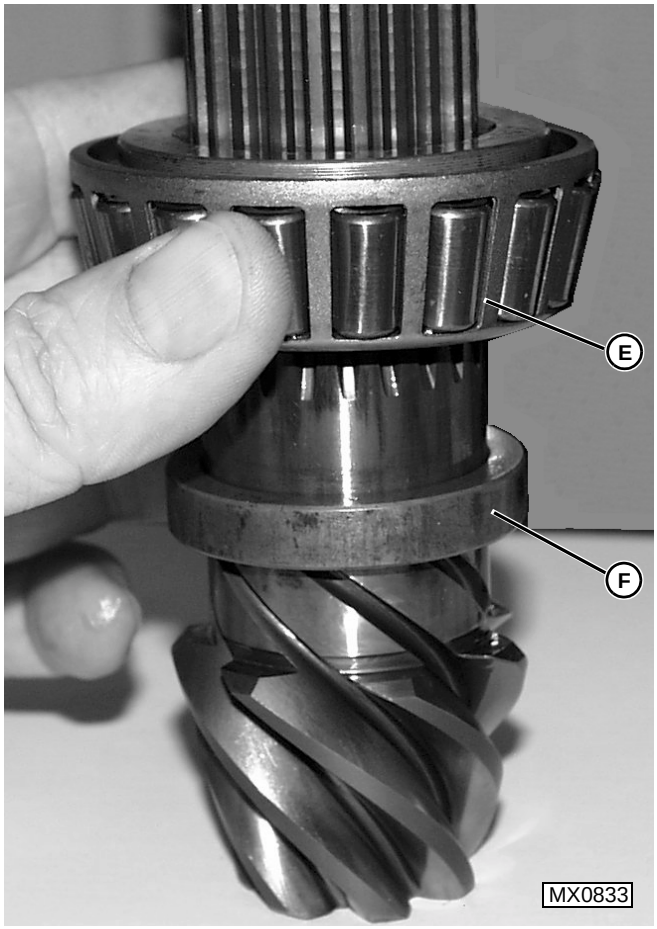
2. Remove snap ring (B) and locknut (C).

NOTE: Locknut is staked into the splines in three places. Use a small tapered punch or similar tool to bend the edge of the locknut back enough to clear splines before attempting to remove locknut, or damage to splines will result. Do not re-use locknut, always replace it with a new one.

3. Remove 36T gear (D).



NOTE: Later production countershaft shown above. Remove Bearing, 40T Gear, and Snap ring (B), using the same procedure as on previous page. Then slide off spacer (D), and remove locker and nut (C).



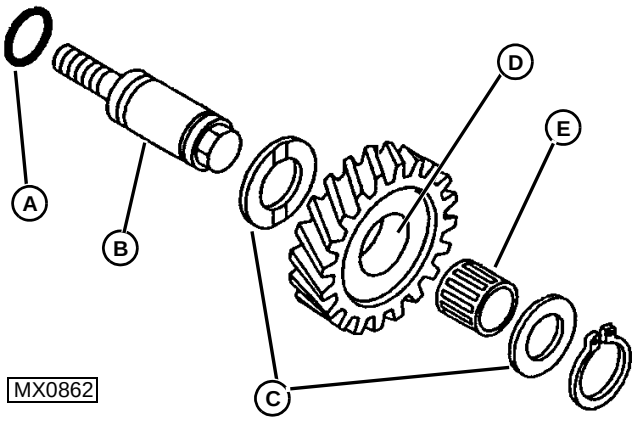
4. Press bearing (E) from shaft and remove spacer (F).

Assembly:

Assemble in the reverse order of disassembly.

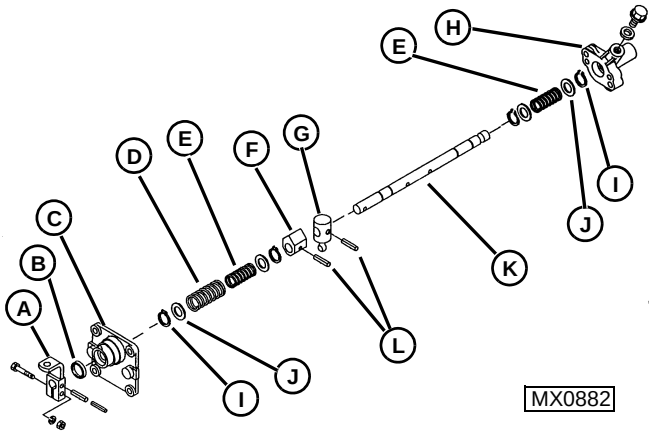
- **Early Production -** Tighten locknut on 38T gear to **166 N•m (123 lb-ft)** and stake collar on locknut into splines in three places 120° apart.
- **Later Production -** Tighten locknut on 38T gear to **166 N•m (123 lb-ft)** and install locker on a spline where it will engage into slots on locknut. Install spacer.

REVERSE IDLER SHAFT AND GEAR



1. Disassemble reverse gear and shaft assembly.
2. Inspect shaft (B), inner bore of gear (D), and bearing (E) for wear or damage. Replace parts as needed.
3. When assembling make sure oil grooves on washers (C) are facing toward the gear and the raised side of gear hub is facing the threaded end of the shaft.
4. Replace O-ring (A).

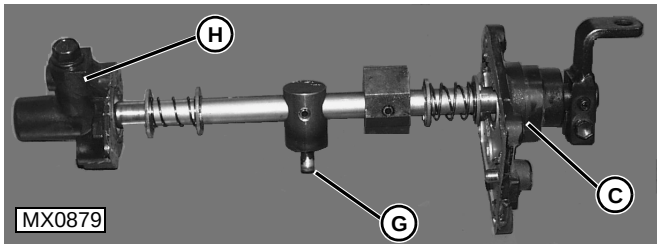
SHIFTER



A. Shifter Lever	H. Cover
B. Seal	I. Snap Ring (4)
C. Cover	J. Washer (4)
D. Outer Spring	K. Shaft
E. Spring	L. Roll Pin (2)
F. Neutral Indicator	
G. Shifter	

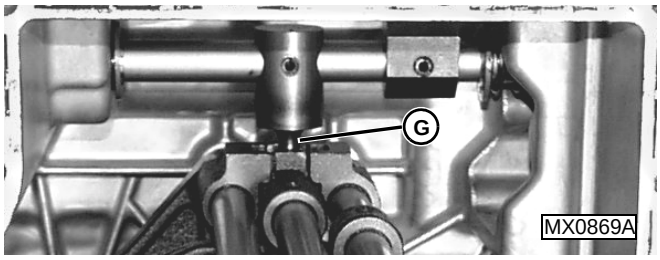
NOTE: Shifter does not need to be removed for transmission service unless a problem is suspected. Shifter can be removed with transmission in the vehicle.

1. If transmission is assembled, place lever in reverse position (lever A out and back).
2. Remove cap screws securing covers (C) and (H).
3. Remove cover (H).
4. Remove cover (C) and shaft assembly (K).
5. Check shifter for worn or broken parts, replace as needed.



Assembly:

1. Replace shaft seal (B).
2. Install shaft assembly into transmission. If transmission is assembled, place outermost shift shaft to front (reverse) position. Make sure lever (G) is engaged in slot in shift shafts.

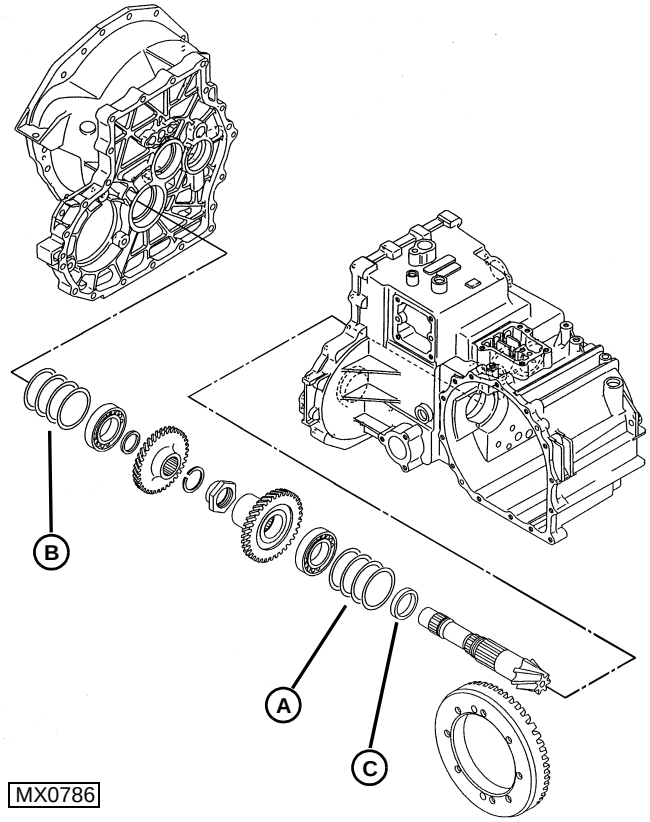


3. Apply TY15130 John Deere Form in Place Gasket to the covers (C) and (H) and install covers.
4. Check shifting for proper operation.

COUNTERSHAFT SHIMMING PROCEDURE

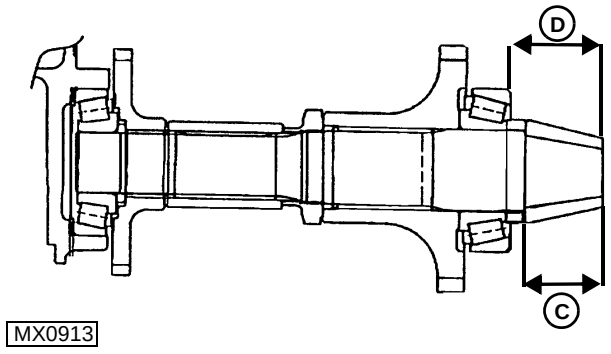
NOTE: This procedure only needs to be performed when countershaft, bearings or transaxle cases have been changed. If none of these parts have been changed, install original shims in original positions.

NOTE: Countershaft and ring gear are a matched set and must be replaced as a set.

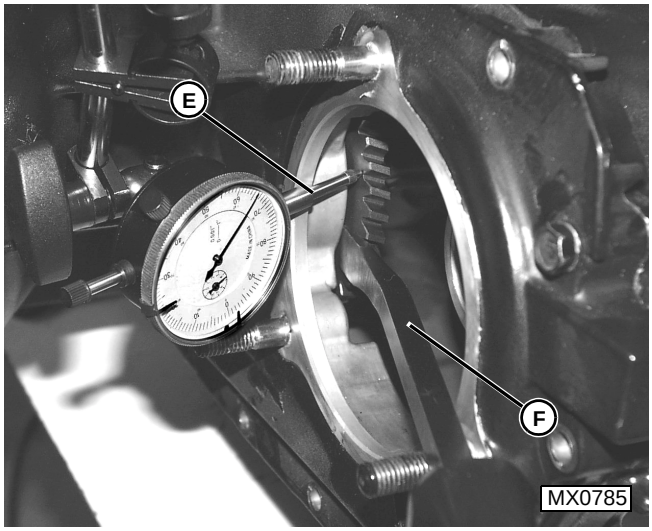


- Shims (A) and spacer (C) set pinion depth.
- Shims (B) set bearing preload

To determine thickness of shims for pinion depth:

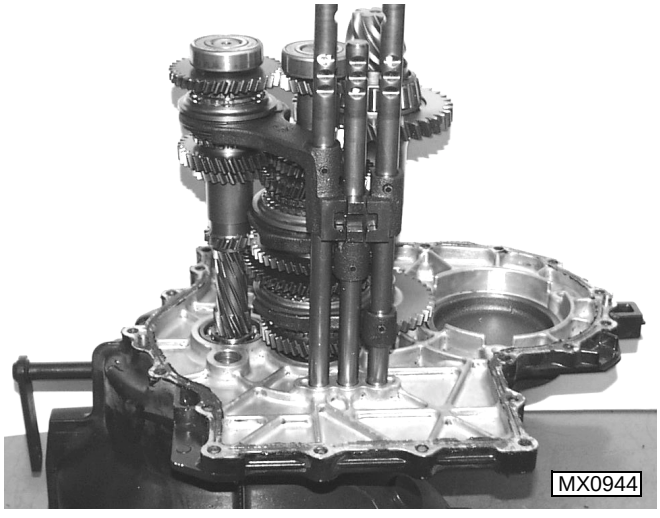


1. Measure width of gear (C).
2. Hold bearing race against bearing cone and measure distance between end of outer bearing race (D) and end of gear.
3. Subtract measurement C from measurement D.
4. Subtract 6.25 mm (0.246 in.) from difference calculated in step 3.
5. This is the thickness of shims (A) to be placed between the bearing race and the transaxle case.

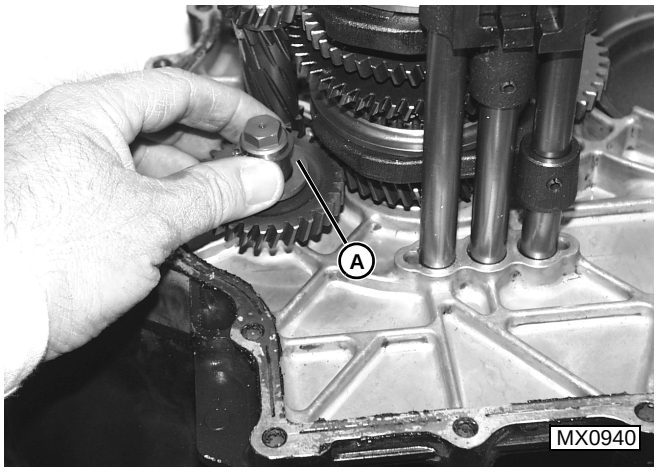


6. Install the countershaft into the transmission case **with the shims** installed behind the pinion gear end bearing race, and **without any shims** behind the bearing race in the front cover.
7. Install the front cover with five or six cap screws and tighten to specification.
8. Install dial indicator (E) to transmission case and countershaft gear as shown.
9. Using a small pry bar or large screwdriver (F) pry countershaft back and zero dial indicator. Pry countershaft forward and record measurement of total travel. Add 0.1mm (0.003 in.). This is the thickness of shims to be installed behind the front cover bearing race.

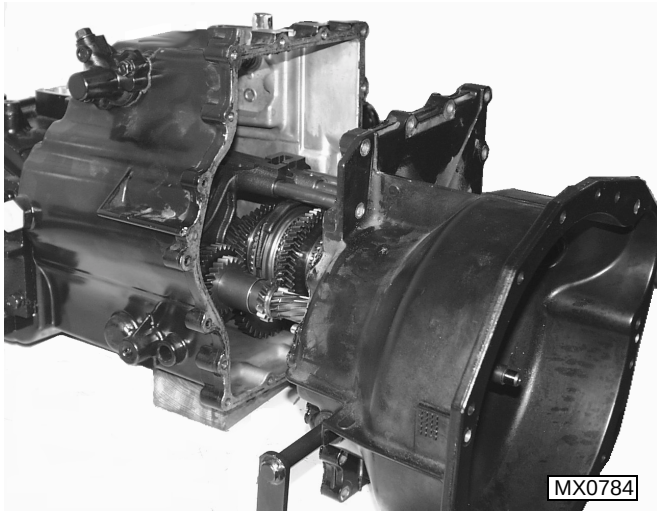
TRANSMISSION ASSEMBLY



1. Group the three shafts and shift forks together and install them into the clutch housing.



2. Lubricate the O-ring on the reverse idler shaft and install reverse idler (A). Make sure extended hub side of gear is toward clutch housing and oil grooves in washers are facing gear. Apply medium strength threadlock to threads and install washer and nut on reverse idler shaft and tighten to **44-59 N•m (33-43 lb-ft)**.
3. Apply thin bead of TY15130 John Deere Form in Place Gasket to front cover mating surface.



4. Slide clutch cover and gear shafts into transaxle case far enough to get shift shafts started in their bores.

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first, and then click the above link

to download the complete manual.

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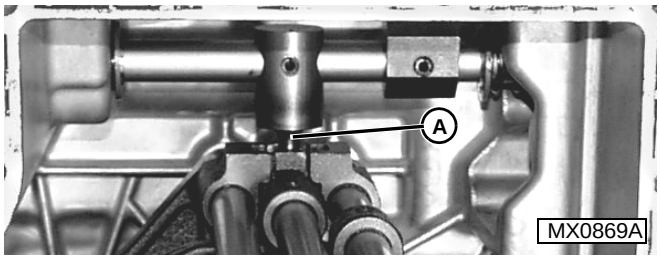
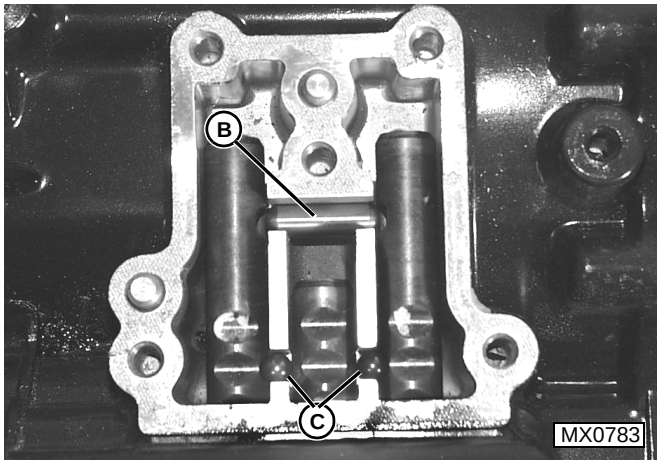
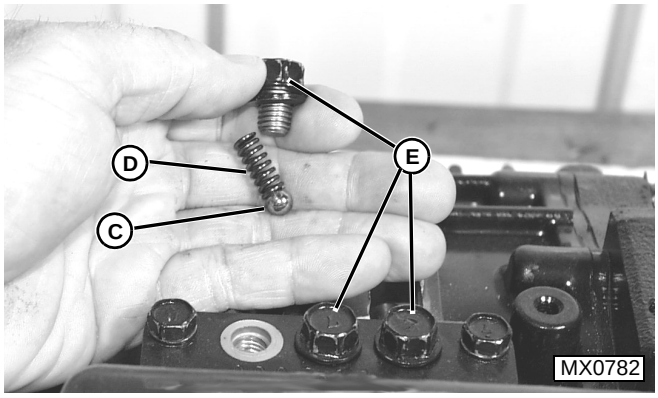


5. While sliding shift shafts in, make sure shift lever (A) engages in slots in shift rods.
6. Replace input shaft seal.
7. Seat the front cover on the transmission housing and install cap screws. Tighten cap screws to **23 - 29 Nm (17-21 lb-ft.)**

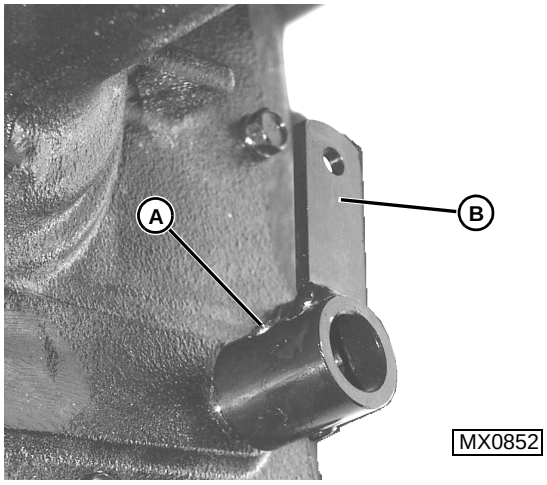


8. Install pin (B) and balls (C) to shift shafts.
9. Install detent cover.

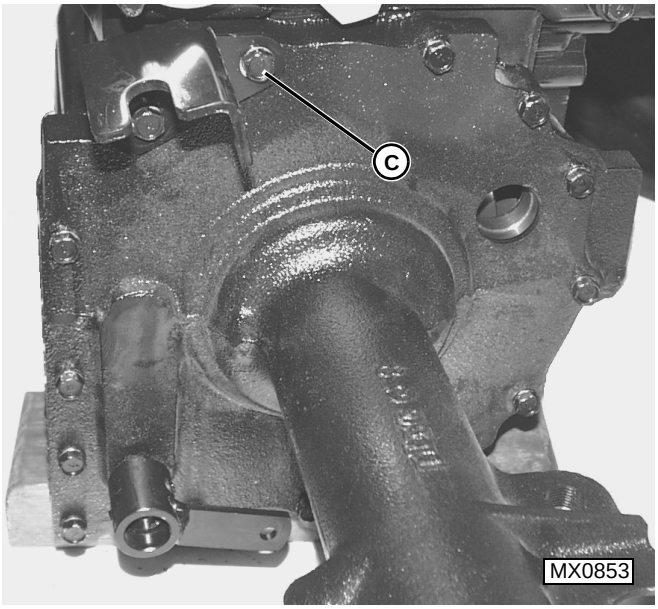


10. Install balls (C) and springs (D).
11. Install three cap screws (E).

DIFFERENTIAL REMOVAL AND INSTALLATION



1. Remove roll pin (A) and lever (B) from differential lock shaft.



2. Remove 14 cap screws (C) securing left axle housing to transaxle case and remove axle housing.

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