Service Manual

4x2 Utility Vehicle

Poly Bed and Steel Bed

NOTE: These materials are prepared for use by trained technicians who are experienced in the service and repair of equipment of the kind described in this publication, and are not intended for use by untrained or inexperienced individuals. Such individuals should seek the assistance of an authorized service technician or dealer. Read, understand, and follow all directions when working on this equipment. This includes the contents of the Operators Manual, which came with your equipment. No liability can be accepted for any inaccuracies or omission in this publication, although every care has been take to make it as complete and accurate as possible. The right is reserved to make changes at any time to this document without prior notice and without incurring an obligation to make such changes to previously published documents. All information contained in this publication is based on product information available at the time of publication. Photographs and illustrations used in this publication are for reference use only and may not depict actual model and component parts.

MTD Products Inc. - Product Training and Education Department

FORM NUMBER - 769-01635

12/2004

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Poly Bed 4 X 2 Drive System

ABOUT THIS SECTION:

This section covers the drive system and transaxle used in the Big Country utility vehicle model series 414 (37AN414J710). This model is distinguished from the 420 and 430 series by a polymer bed and the use of a different drive system. The 420 and 430 series use a Honda 18 hp. V-twin engine and a Dana transaxle. The 414 uses a drive system manufactured by Kawasaki.

1. CUSTOMER RESPONSIBILITIES

- Housing, axle, bearing, or axle tube damage caused by impact or over-loading constitutes customer abuse, and is not covered under the warranty. The poly bed Big Country has a lower load rating than the steel bed version: 900 Lb. (410 KG) including bed load, operator, and passenger.
- Damaged caused by shock-loading the transmission is not covered under the warranty. Shock-loading is primarily caused by shifting between forward and reverse gears without allowing the vehicle to come to a full stop. This is possible if the vehicle is operated abusively
- Damage caused by a lubrication failure is not covered under the warranty.
- It is the customer's responsibility to have any leaks repaired in a timely fashion.
- The lug nuts should be inspected for looseness after the first ten hours of operation. Lug nuts should be tightened to a torque of 55-60 ft.-lbs.
- The brakes are not self-adjusting. It is the customer's responsibility to maintain them in good working order and proper adjustment, whether directly or through an authorized Cub Cadet Servicing Dealer.
- It is the customer's responsibility to maintain the vehicle in accordance with the Operator's Manual. This includes an initial gear lube change after 50 hours of operation, and changes every 500 hours of operation (or 2 years) thereafter.
- The gear lube level should be checked every 100 hours of operation. At this time a visual inspection should be made for leaks or damage.

2. GEAR LUBE

2.1. **Service intervals:** Initial change: 50 hours
Subsequent changes: 500 hours of 2 years
Check level: every 100 hours.

2.2. The transaxle should contain 68 fluid ounces (2.0 L) API "GL-5" hypoid gear lube.

- SAE 90 weight above 41deg. f. (5 deg. C.)
- SAE 80 weight below 41 deg. f. (5 deg. C.)

2.3. To **check the gear lube** level, park the vehicle on a flat level surface.

2.4. Clean the area around the oil fill cap/dipstick near the back of the transaxle housing and remove the dipstick.

2.5. Wipe the dipstick clean, insert it back into the threaded hole, but do not thread it in.

2.6. Withdraw the dipstick and check the oil level. It should be between the upper and lower level lines. The area between the lines is marked with cross-hatch. See Figure 2.6.

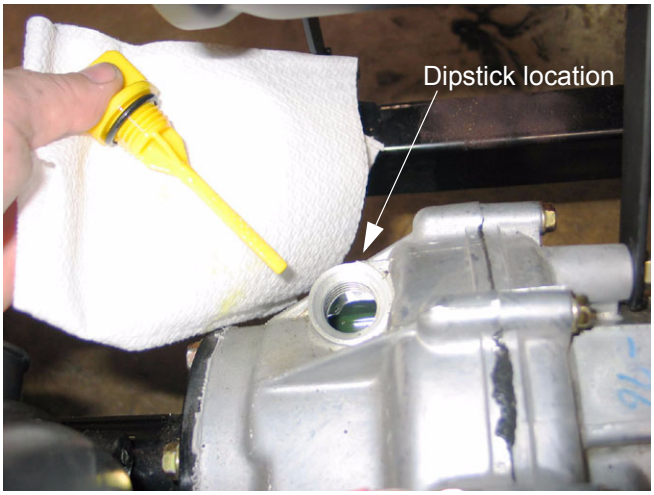

Figure 2.6

2.7. If additional lube is needed, confirm the current contents of the transaxle, and add more of the same to reach the specified level.

2.8. If additional fluid is needed, inspect the transaxle for leaks or damage. If leakage is found, make any necessary repairs before returning the vehicle to service.

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2.9. A blocked vent can provoke oil leaks. The vent is located at the top of the transaxle housing. See Figure 2.9.

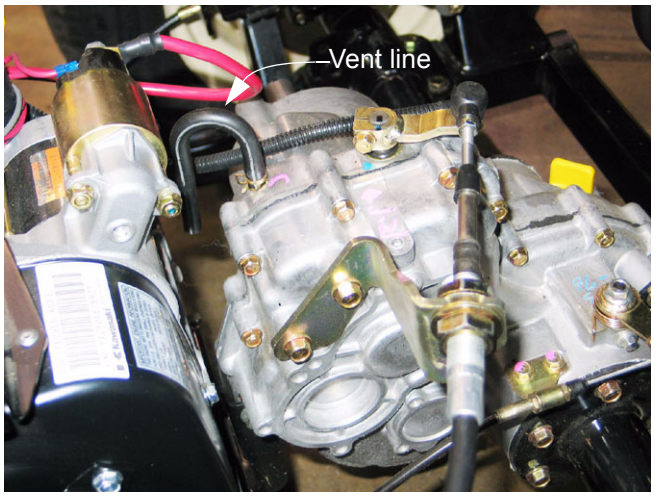

Figure 2.9

2.10. To **change the gear lube**: Clean the area around the fill and drain plugs before removing either.

2.11. Place a drain pan under the transaxle. See Figure 2.11.

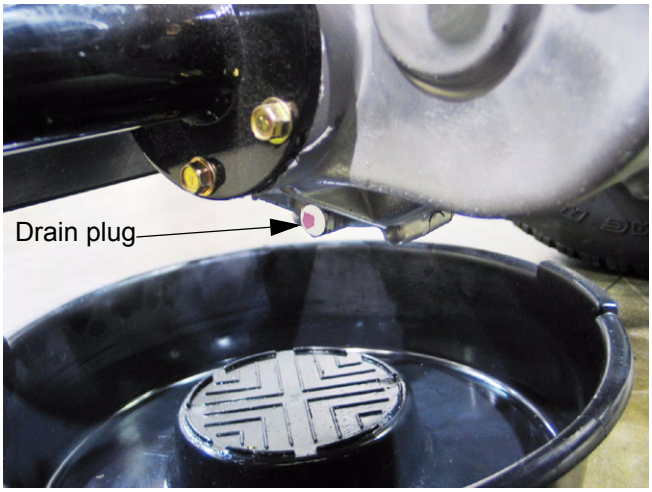

Figure 2.11

2.12. Remove the drain plug at the lower left corner of the transaxle using a 12mm wrench.

NOTE: 80 and 90 weight gear lubes are very thick at low temperatures, and may take considerable time to drain if the ambient temperature is below 41 deg. f. (5 deg. C.)

2.13. Remove the oil fill cap/dipstick. This will allow air to enter the transaxle faster, which will allow the gear lube to drain faster.

2.14. Install the drain plug and tighten it to a torque of 132 in.-lb. (15 N-m).

2.15. Add 68 fluid ounces (2.0 L) API “GL-5” hypoid gear lube, and install the oil fill cap/dipstick.

- SAE 90 weight above 41deg. f. (5 deg. C.)
- SAE 80 weight below 41 deg. f. (5 deg. C.)

2.16. Confirm the correct fluid level by by inserting (but not threading-in) the fill cap/dipstick, and withdrawing it to read the level.

3. DIAGNOSIS: CONFIRMING TRANSAXLE FAULT

3.1. Get as much information as possible from the customer regarding symptoms and circumstances.

3.1. Inspect the vehicle for physical damage and clues regarding the nature and cause of failure.

3.2. Carefully operate the vehicle if possible, to confirm noises and symptoms.

3.3. Confirm whether the problem is internal, in the shift linkage, brake system, or the belt drive system (CVT):

- If a drive gear (forward or reverse) or the differential lock fail to engage or disengage by manually overriding the shift mechanism.
- Shift mechanism issues can be isolated from internal issues by disconnecting the cables at the transaxle end, and operating the transaxle directly.
- Performance problems such as failure to reach full speed are likely to be caused by engine, brake, or belt/clutch issues.
- Complaints of “lurchy” operation are an indication that the brakes may be dragging or adjusted too tight.
- It is easy to check for dragging brakes by pushing the vehicle with the parking brake released, or by jacking-up the back of the vehicle and checking the wheels for ease-of rotation.
- Refer to the “Brake” section of this manual for service and adjustment information.
- Gear clash can result from drive being applied to the input shaft during shifting. Refer to the “CVT” section of this manual for performance information.
- Gear “spit-out” or gear clash when the gear selector is in Neutral can result from a misadjusted shift linkage. Refer to the “Transmission Linkage” section of this manual.
- Under-steer (vehicle is less responsive to steering wheel in-puts) accompanied by rear wheel squeal during turning maneuvers indicates that the differential lock is engaged. If this condition exists when the differential lock lever is released, refer to the “Transmission Linkages” section of this manual.

4. TRANSMISSION LINKAGES

Shift Control Cable

4.1. It is possible to remove the gear shift control cable and gear shift control independently or together.

4.2. To gain access to the gear shift control, tilt both seats forward, and remove the console/cup holder using a 7/16” wrench. See Figure 4.2.

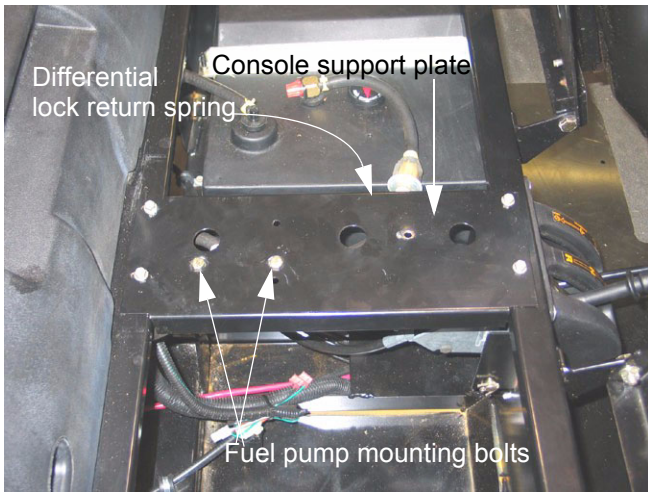

Figure 4.2

4.3. Unbolt the console support plate from the frame using a 7/16” wrench.

NOTE: The vacuum driven fuel pump is mounted to the bottom of the console support plate. It may be unbolted from the plate using a pair of 7/16” wrenches so that the plate may be completely removed. It is not absolutely necessary to unbolt the fuel pump if the support plate is only moved aside for access.

4.4. Un-hook the differential lock return spring from the console support plate, and move (or remove) the plate.

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4.5. There is a black plastic cover on the gearshift control. Slide it rearward, then lift it away from the gear shift control to expose the cable attachment. See Figure 4.5.

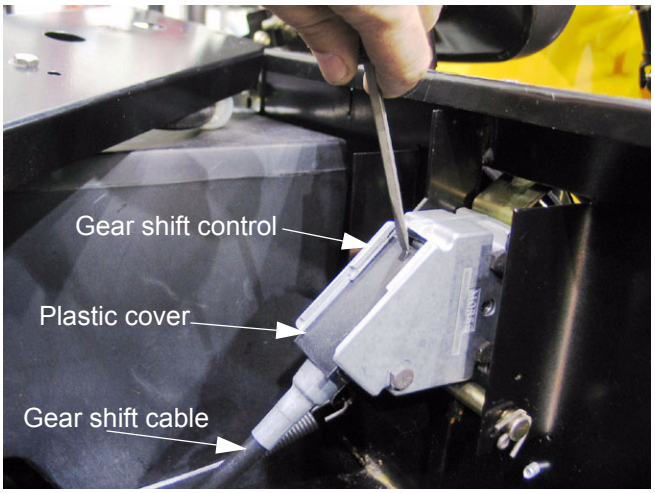

Figure 4.5

NOTE: There is a lip at the front edge of the cover that will provide sufficient purchase to slide the cover back.

4.6. With the cover removed, lift the shift control cable housing end out of the recess that locates it in the shift control housing. See Figure 4.6.

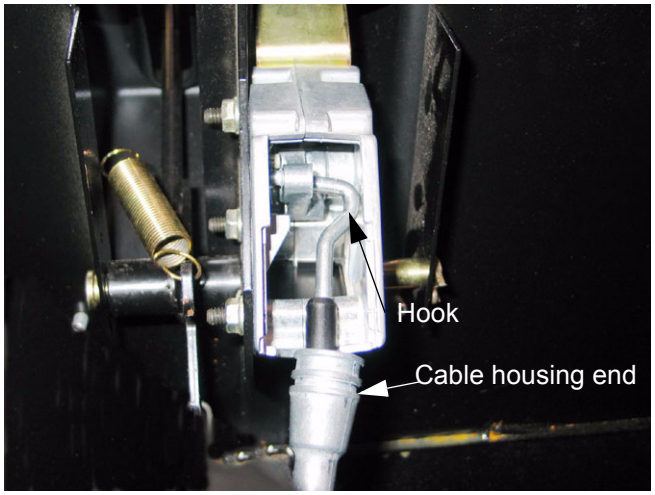

Figure 4.6

4.7. Disengage the hooked end of the cable from the shift control and lift the cable out of the shift control housing.

Shift Control

4.8. If the shift control is to be removed, the knob must be taken-off the shift lever. It threads off. See Figure 4.8.

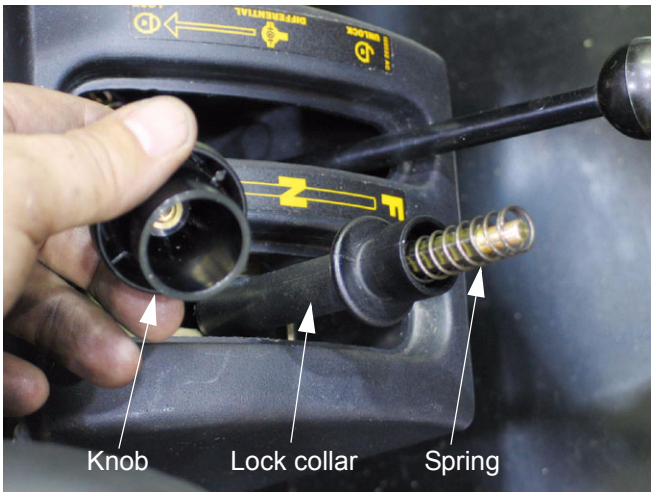

Figure 4.8

4.9. The knob retains a spring and a lock collar. Both can be removed after the knob is taken off. See Figure 4.9.

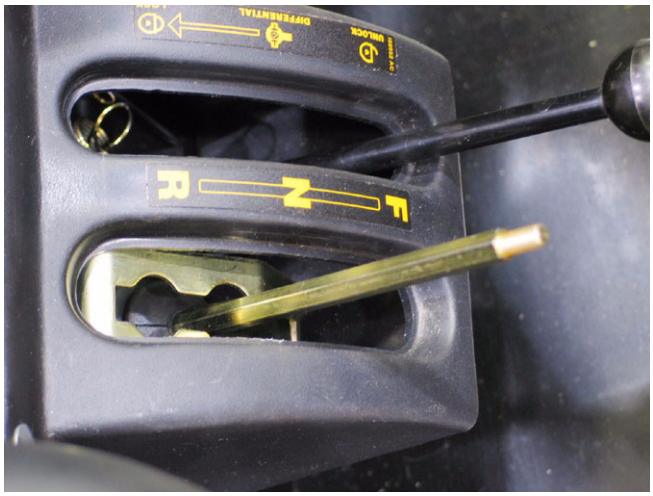

Figure 4.9

4.10. Three nuts and bolts secure the shifter control to the frame. The nuts may be removed with a pair of 7/16” wrenches. The shifter control may then be removed.

4.11. There are no internal replacement parts available through Cub Cadet for the shifter control. It is to be replaced as an assembly.

4.12. Within the housing for the shifter control there is a torsion spring that returns the shift lever to the center of its travel. There is not a detent mechanism in the shifter control. See Figure 4.12.

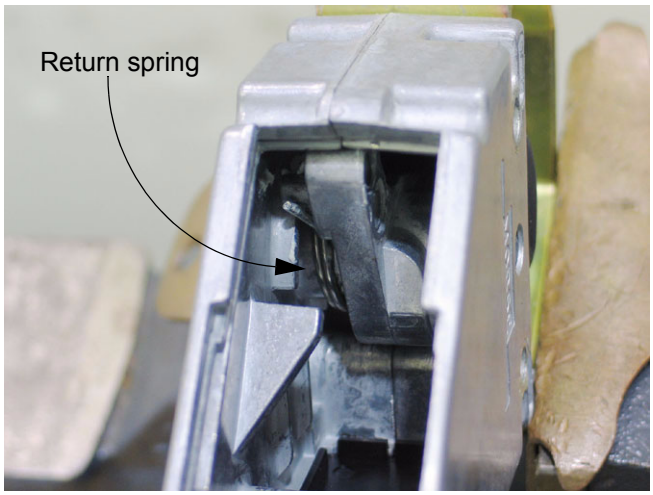

Figure 4.12

4.13. On installation of the shifter control:

- Position the bolts in the shifter control housing prior to installation. There is insufficient lateral clearance to instal them all in-situ.
- Tighten the nut to 96 in-lb. (10.848 Nm). If the nuts are too tight, the housing will distort, and operating effort will increase.

4.14. If the cable is to be replaced, the front end of the cable can be disconnected as described in the procedure for removal of the shifter control.

4.15. The back end of the cable is permanently attached to the shifter arm. See Figure 4.15.

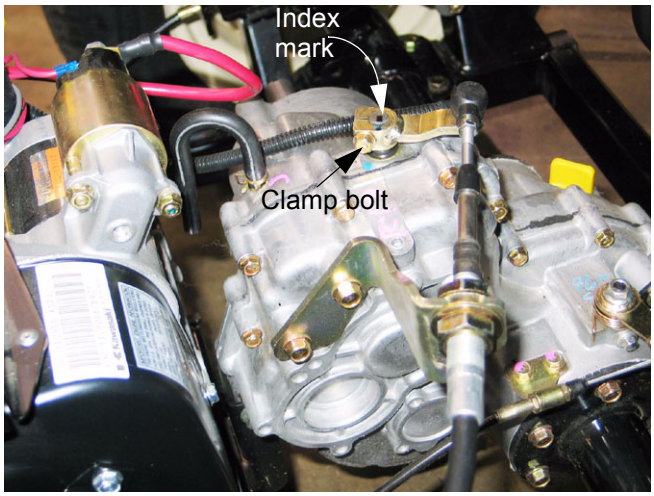

Figure 4.15

4.16. Match-mark the shifter arm to the splined end of the shift arm shaft, then remove the clamp bolt using a 10 mm wrench.

NOTE: The clamp bolt engages a groove in the shift shaft. It must be removed.

4.17. Use a pair of 7/8” wrenches to remove the end jam nut on the threaded end of the cable housing. The cable core will pass through a slot in the bracket. See Figure 4.17.

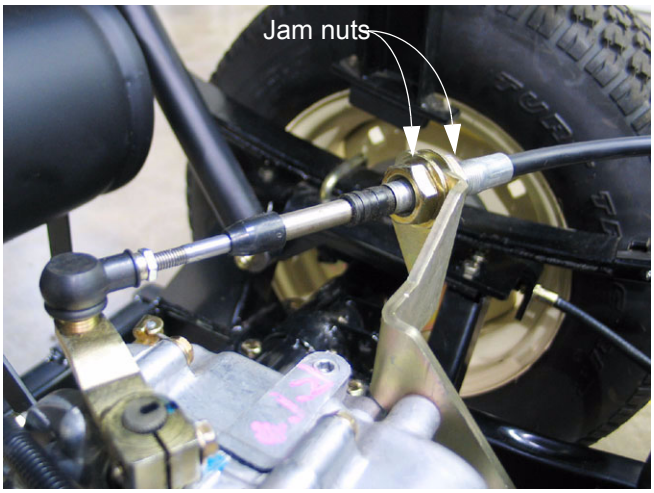

Figure 4.17

4.18. The cable can be withdrawn from the vehicle in either direction. See Figure 4.18.

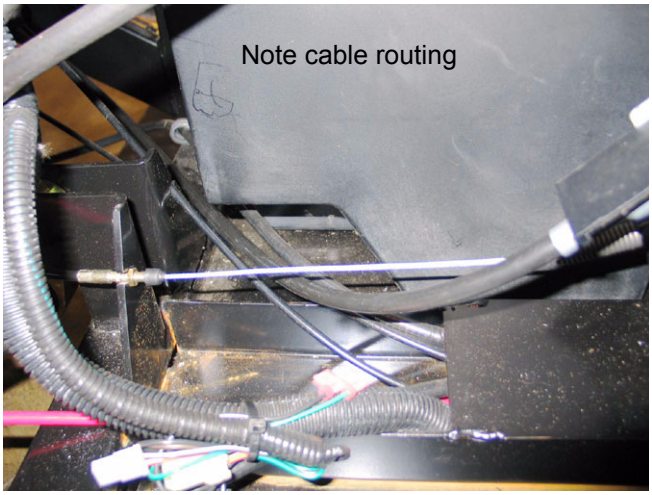

Figure 4.18

NOTE: The correct routing of the cable: through the recess in the lower front corner of the tank.

4.19. Confirm that the cable is correctly adjusted before returning the vehicle to service.

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Shift Control Adjustment

4.20. To adjust the shift cable, use the neutral safety switch to confirm the neutral position. See Figure 4.20.

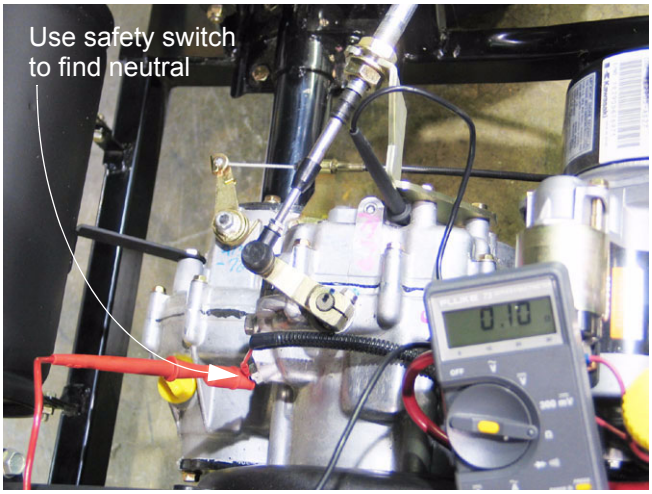

Figure 4.20

- Connect a powered continuity light or an Ohm meter between the terminal on the neutral switch and a good ground. This test works key-off.
- Otherwise, connect a test light in series between the terminal on the neutral switch and the eyelet on the wire that attaches to it. This test works key-on, engine-off.
- When the continuity or test light bulb illuminates, or the Ohm meter registers zero, the contacts within the switch are closed.
- When the neutral switch is closed, the transmission is in neutral. Move the shifter through its range of travel to confirm that the switch is working correctly.
- There is a significant range of travel around the neutral position before the contacts in the neutral switch open.

4.21. With the transmission confirmed to be in neutral by the meter or light connected to the switch, move the gearshift lever to the neutral position.

4.22. Adjust the jam nuts as necessary so that the contacts in the neutral switch open when the gearshift lever is moved an equal distance in the direction of forward and reverse gear positions. See Figure 4.22.

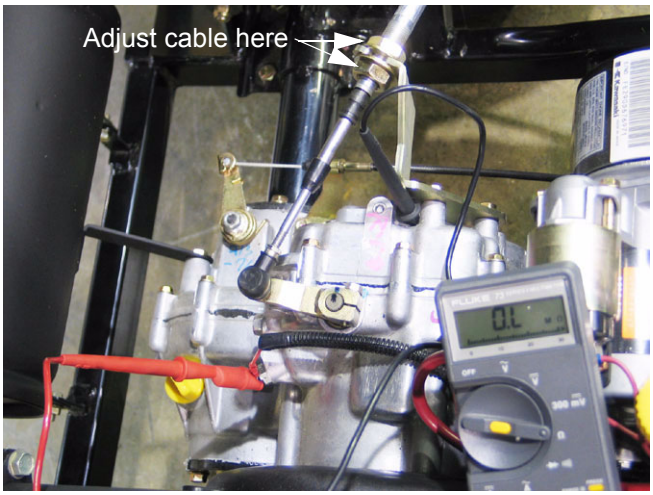

Figure 4.22

4.23. Tighten the jam nuts and test the operation of the shift control before returning the unit to service.

4.24. Inspect the cable for wear or damage. Replace it if there are any signs of fraying, binding, kinking or damage to the cable housing.

4.25. Lubricate the cable with light oil (penetrating oil or cable lube) any time it is removed, and at 500 hr. intervals when the gear lube is changed.

4.26. Depending on the type of service being done, the gear shift control cable may be removed from it sprocket on the transaxle, or the bracket may be removed from the transaxle housing using a 10 mm wrench.

4.27. On installation, the gear shift control bracket should be tightened to a torque of 78 in-lb. (8.8 N-m).

Differential Lock Control

In normal operation, a differential allows the two rear wheels to rotate at different speeds. In a turning maneuver, the wheels toward the outside of the turn follow a path that describes a greater circumference than the wheels toward the inside of the turn. Because the outside wheels must turn faster than the inside wheels, a differential is necessary.

Because it allows the rear wheels to rotate at different speeds, a standard differential can only provide drive to one wheel. One method of getting more traction is to provide a manual device that over-rides the differential feature by locking the two sides of the differential together, providing drive to both rear wheels at the same time.

It is not desirable to lock the differential together all the time because it limits the turning radius of the vehicle:

- The two wheels driving at the same speed tend to want to push the vehicle straight ahead.
- When the vehicle does turn, the two rear wheels will fight against each-other for traction. In the process they will apply exaggerated loads to the drive train.

4.28. In normal use:

- The differential lock should engage when the differential lock lever is pulled-up.
- There are five engagement dogs on the differential. The rear wheels must rotate at most 72 degrees relative to one-another before the engagement dogs align, allowing them to lock together.
- Pulling-up on the differential lock lever extends the spring at the front of the differential lock control cable. The spring applies force to the cable and the differential lock lever on the transaxle. When the engagement dogs align, the spring force will push them into engagement.
- Once engaged, the lever may be released, and the differential will remain locked until the drive load on the left and right wheels is equalized.
- When the drive load between the rear wheels is equalized, the load on the differential lock dogs is relieved. When the load is relieved, torsion spring on the differential lock lever will overcome the friction between the differential lock dogs, and cause them to disengage.

4.29. If the Big Country vehicle exhibits symptoms indicating that the differential lock is not engaging or disengaging properly, investigation should begin with the control cable.

4.30. The differential lock control lever pivots on a large clevis pin. The clevis pin is secured to the frame by a hairpin clip.

4.31. The spring on the end of the differential lock control cable connects to one arm of the differential lock control lever, and a return spring connects to the other arm. The other end of the return spring hooks to the console support bracket.

4.32. To reach the differential lock control and cable: See Figure 4.32.

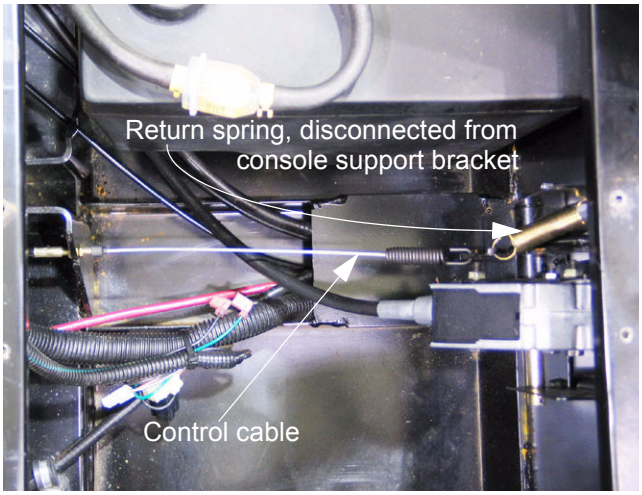

Figure 4.32

- Fold the seats forward.
- Remove the tool box from beneath the passenger seat, if so equipped.
- Remove the cup holder/console using a 7/16” wrench.
- Unbolt the console support bracket using a 3/8” wrench.
- Unhook the differential lock control return spring, and move the console support bracket aside.

4.33. Operate the differential lock control lever, and observe the movement of the cable and differential lock lever on the transaxle.

NOTE: It may be necessary to rotate one of the rear wheels to align the differential lock dogs before full engagement will occur. This is normal.

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4.34. If the linkage binds, disconnect the cable to isolate the external portion of the linkage from internal transaxle components.

4.35. Disconnect the differential lock control cable from the differential lock control lever: Pull the cable forward to get clearance to unhook the spring at the end of the cable. See Figure 4.35.

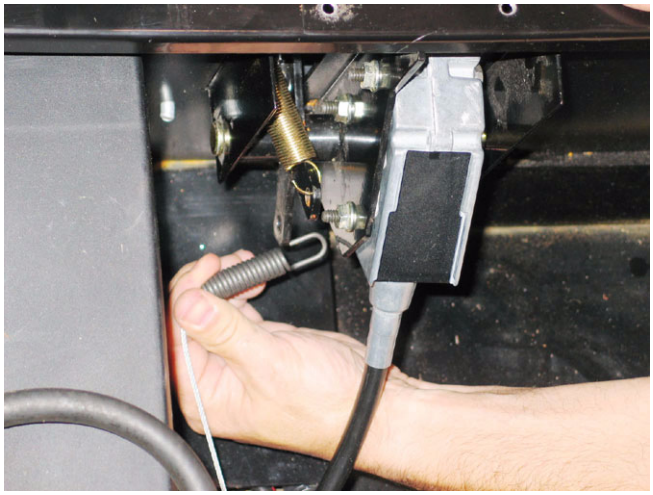

Figure 4.35

4.36. There is sufficient slack in the cable to disconnect the barrel on the rear end of the cable from the differential lock lever on the transaxle as well: either end may be disconnected first. See Figure 4.36.

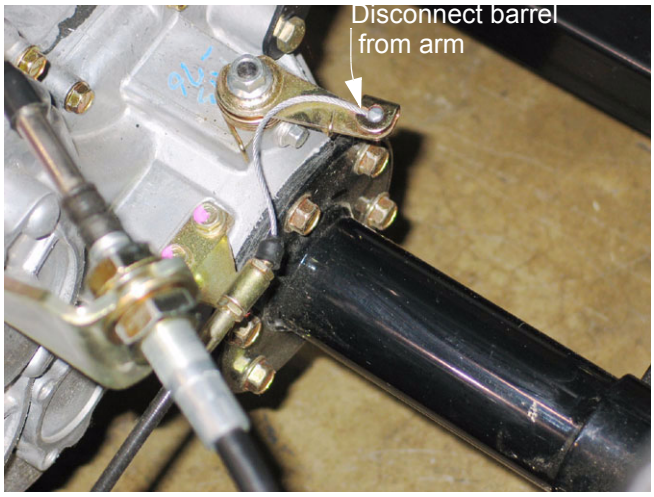

Figure 4.36

4.37. With the cable disconnected, check the operation of the differential lock lever, and the torsion spring that returns it to the unlocked position. See Figure 4.37.

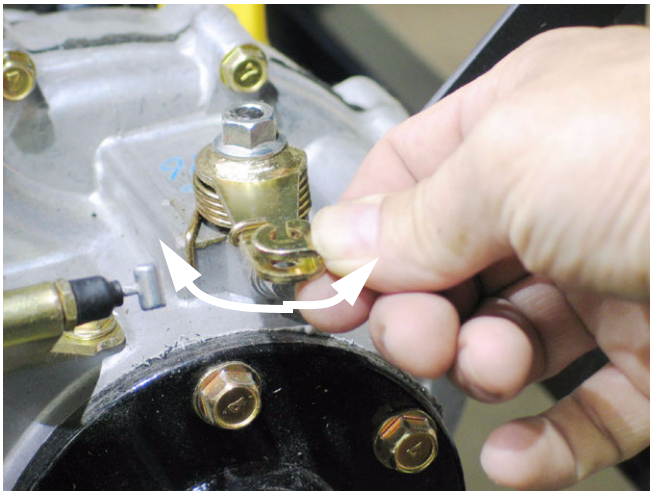

Figure 4.37

NOTE: Confirm that the torsion spring is properly positioned. Replacement of the torsion spring with one that has a shorter leg was the subject of Service Bulletin CC-456

4.38. The back of the cable is secured to the cable holder by a pair of jam nuts: one on each side of the cable holder. See Figure 4.38.

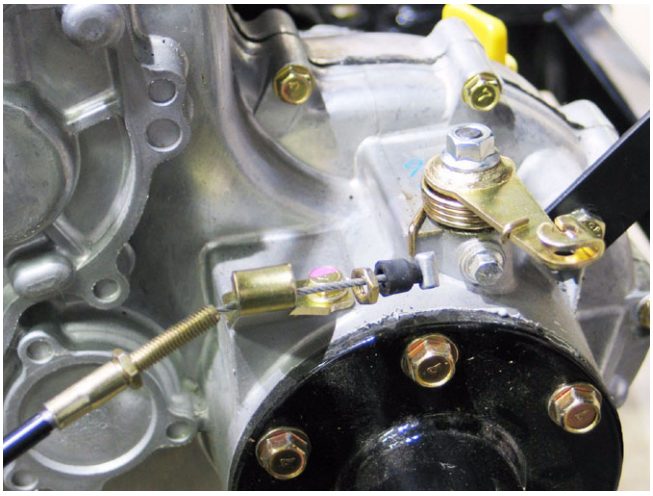

Figure 4.38

4.39. Depending on the nature of the repair, the cable holder can be unbolted from the transaxle housing, or the rear jam nut can be removed and the cable withdrawn from the holder. A 10mm wrench will fit the jam nuts and the cable holder bolts.

4.40. Tighten the cable bracket mounting bolts to a torque of 78 in-lb. (8.8 N-m) on installation.

4.41. The cable is secured to a bracket near the front mounting point of the engine and transaxle cradle. See Figure 4.41.

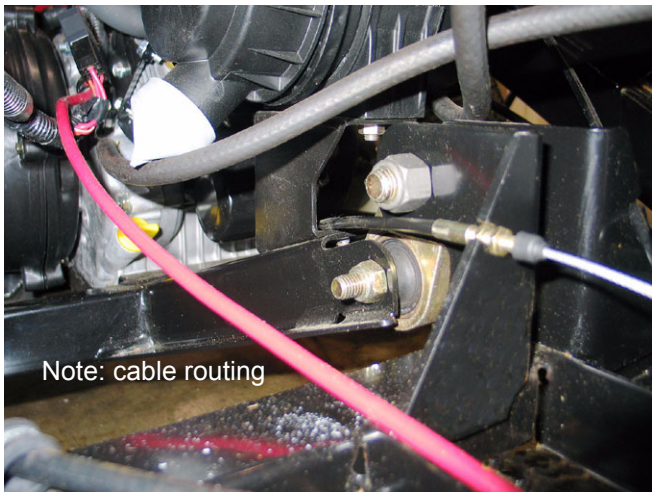

Figure 4.41

4.42. The cable is secured by two jam nuts that can be removed using a 10 mm wrench.

4.43. Correct cable routing: cable mounted to right side of bracket, then curved to the left to pass beneath the air filter bracket.

4.44. Inspect the cable for wear or damage. Replace it if there are any signs of fraying, binding, kinking or damage to the cable housing.

4.45. Lubricate the cable with light oil (penetrating oil or cable lube) any time it is removed, and at 500 hr. intervals when the gear lube is changed.

4.46. The clevis pin that holds the differential lock control lever to the frame cannot be removed with the fuel tank secured in position. See Figure 4.46.

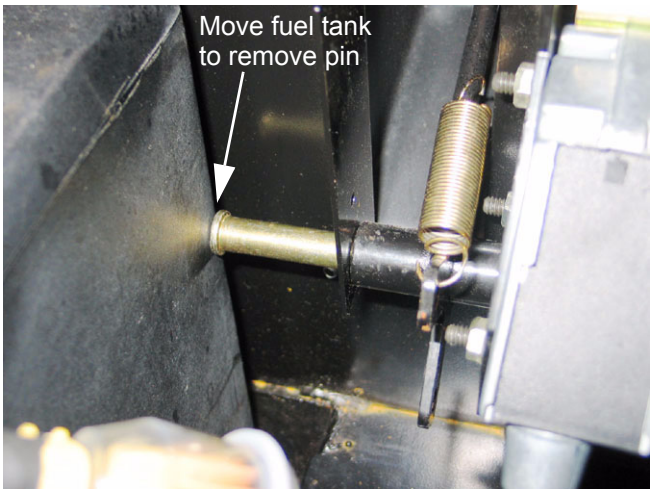

Figure 4.46

4.47. The fuel tank bracket assembly can be removed using 7/16” wrench. See Figure 4.47.

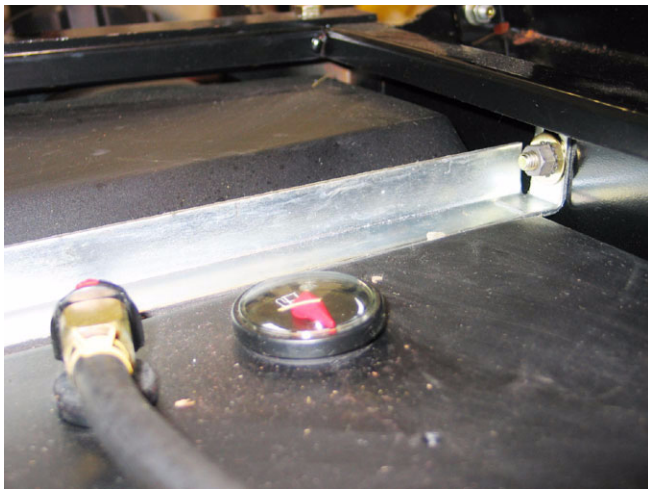

Figure 4.47

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4.48. With the bracket removed, the fuel tank can be moved far enough back to allow the clevis pin to be removed. See Figure 4.48.

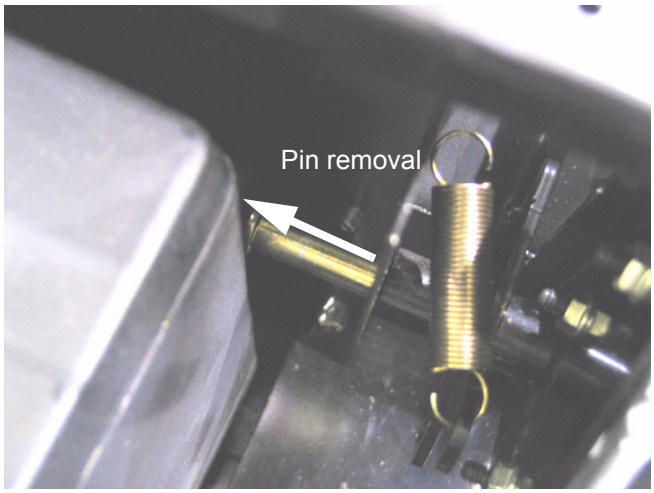

Figure 4.48

4.49. Apply anti-seize compound or white lithium grease to the portion of the pin that the differential lock control lever pivots on when it is reinstalled.

Differential Lock Control Cable Adjustment

4.50. When the differential lock is disengaged, the spring at the front of the cable should be fully retracted, there should be slight slack in the cable, and the differential lock control arm should be at the end of its rearward travel (all the way back). See Figure 4.50.

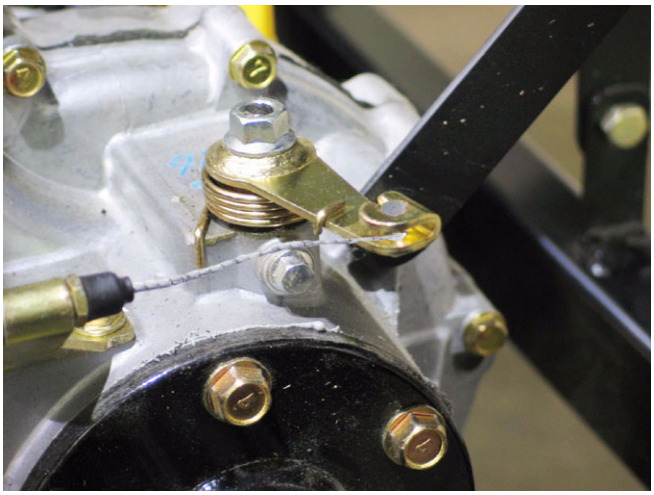

Figure 4.50

4.51. When fully engaged, the differential lock arm should pull forward about 7/8” (2.22 cm) as measured at the center of the barrel on the end of the cable core. See Figure 4.51.

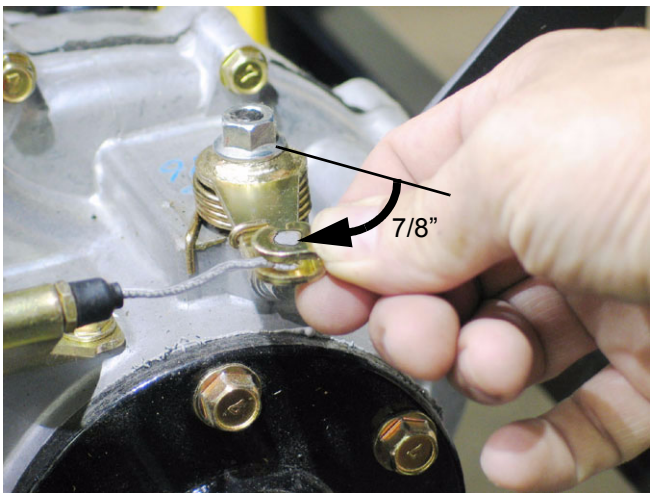

Figure 4.51

4.52. There is much more travel available to the cable than is necessary to fully engage the differential lock. The spring at the front of the cable accommodates the over-travel.

4.53. As long as the arm on the transaxle hits the back end of its travel when the differential lock is released, and hits the front end of its travel when the differential lock is engaged, the cable adjustment is correct.

4.54. If cable adjustment is necessary, it may be accomplished with the jam nuts on either side of the differential lock cable bracket.
See Figure 4.54.

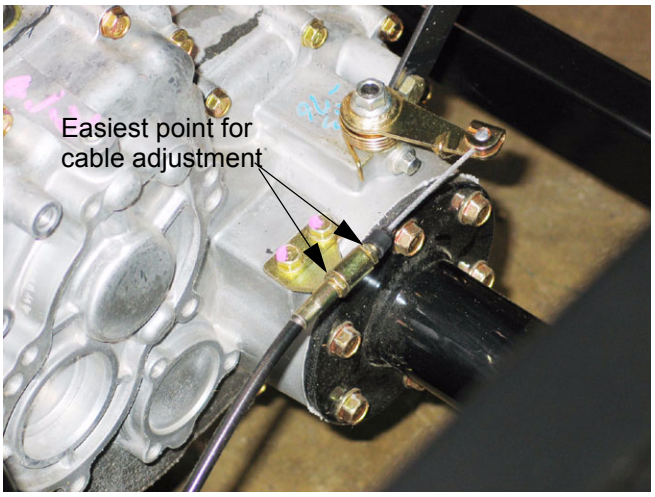

Figure 4.54

5. DIAGNOSIS AND SERVICE: DRIVE BELT AND CLUTCHES (CVT OR CONTINUOUSLY VARIABLE TRANSMISSION)

5.1. Performance problems such as lack of power or failure to reach full speed may be caused by: engine performance issues, dragging brakes, or belt/clutch issues.

5.2. Confirm whether the problem is internal to the transaxle, in the brake system, or in the belt drive and pulley system (CVT):

Transaxle

- If one drive gear (forward or reverse) or the differential lock fail to engage or disengage by manually overriding the shift mechanism.
- Problems originating in the CVT will effect travel in both forward and reverse: The belt and clutches act on the input shaft of the transaxle.
- If forward or reverse gear is engaged, the brakes released, and the vehicle is pushed, the input shaft of the transaxle should rotate.
- The driven pulley is visible through an air exhaust port in the back of the belt cover. It should rotate with the input shaft of the transaxle.
- If the driven pulley does not rotate when the vehicle is pushed in gear, the problem lies within the transmission, the gear shift control/cable, or the driven pulley has come loose from the input shaft.

Brakes

- Complaints of “lurchy” operation are an indication that the brakes may be dragging or adjusted too tight.
- It is easy to check for dragging brakes by pushing the vehicle with the parking brake released, or by jacking-up the back of the vehicle and checking the wheels for ease-of rotation.
- Refer to the “Brake” section of this manual for service and adjustment information.

Engine

- Engine performance issues will likely be accompanied by other engine-based symptoms: oil smoke, black smoke from an overly rich condition, rough running, or poor idle quality.
- Refer to the Engine” section of this manual for diagnosis and repair of engine performance issues.

CVT

- Gear clash can result from drive being applied to the input shaft during shifting (at idle speed).
- Possible causes of drive force being applied at idle speed include: high idle speed, misalignment between engine and transaxle, wrong belt, damaged driving pulley or damaged driven pulley.
- Loss of drive (complete or slippage) may occur because of a worn belt, wet belt / pulleys, damaged pulleys.
- Loss of top speed other than engine or brake problems) may occur because of a worn belt, wet belt / pulleys, damaged pulleys.
- Most CVT diagnosis is done through simple observation and measurement.
- This is an enclosed drive system with an air filter and a cooling fan. Loss of air-flow will cause the CVT to over-heat, and will effect performance.

Maintenance

- The CVT system should be inspected at 250 hour or 1 year intervals. The air filter should be removed and inspected, and the CVT cover should be removed for belt measurement and inspection.
- The air filter should be inspected every 50 hours of operation.
- Air filter life will vary with operating conditions. A dusty environment will necessitate more frequent maintenance of the engine and CVT air filters.
- Belt life will vary with operating conditions. High load, high ambient temperatures, dusty conditions, operation on grades, and high number of stop/start cycles are among factors that will tend to shorten belt life.
- Any change in performance noted by the operator should prompt inspection.
- Any factors indicative of potential drive problems should prompt inspection. eg.: evidence of rodent nesting, or evidence of oil leakage from engine or transaxle.

Poly Bed 4 X 2 Drive System

Inspection

5.3. Park the vehicle on a firm level surface, with the ignition turned off, and lift the load bed to provide access to the drive system.

5.4. Allow the exhaust system to cool before proceeding.

5.5. Inspect the CVT system air filter. The filter is located in front of the outer cover for the CVT. It is connected to the intake plenum by a molded hose, and it is connected to the outer CVT cover by a flexible hose. See Figure 5.5.

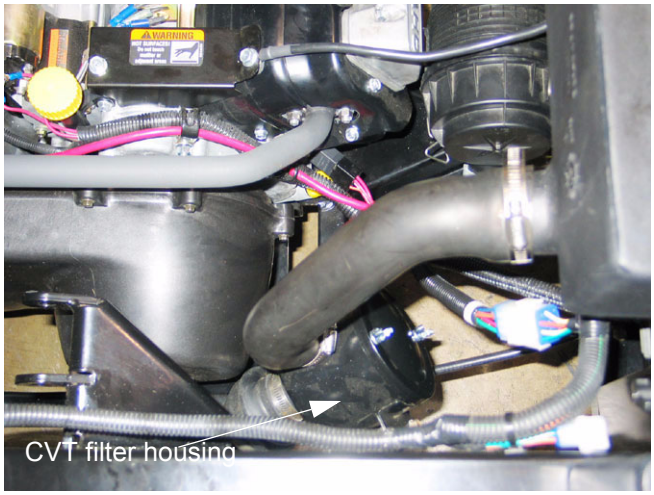

Figure 5.5

5.6. Remove the two wing screws from the air filter cover.

5.7. Lift the cover and remove the filter. See Figure 5.7.

Figure 5.7

5.8. The CVT air filter has a foam wrap pre-filter over the paper filter element. The foam wrap can be washed in mild detergent, rinsed, dried, and re-used. Do not oil the foam wrap. See Figure 5.8.

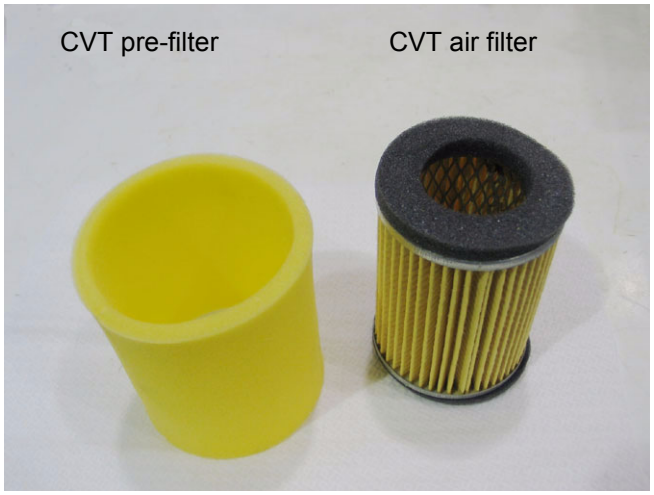

Figure 5.8

5.9. The paper filter can be tapped-out. Do not blow it clean with pressurized air. Replace it if it shows significant dirt between the pleats.

5.10. To remove the CVT drive cover, the air filter assembly must be removed.

5.11. Loosen the hose clamp that secures the flexible hose from the air filter to the CVT cover, and disconnect the hose from the cover. See Figure 5.11.

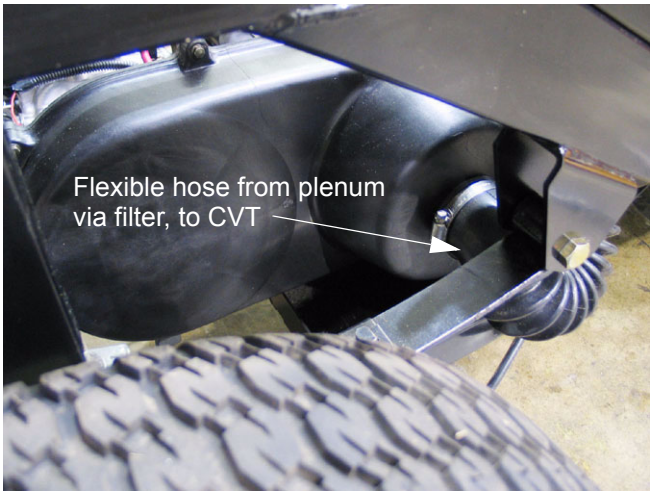

Figure 5.11

5.12. Loosen the hose clamp that secures the molded hose from the air filter to the plenum. See Figure 5.12.

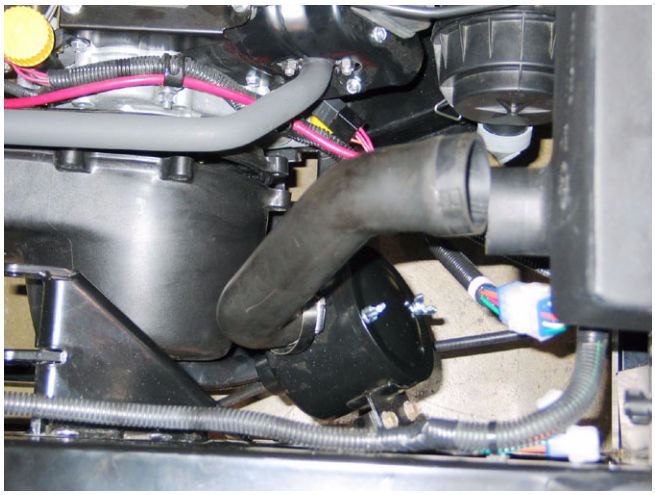

Figure 5.12

5.13. Remove the two bolts that hold the air filter housing to the air filter bracket using a 1/2" wrench, and remove the filter assembly.

5.14. The exhaust pipe interferes with the removal of the CVT cover. It must be removed.

NOTE: For testing and diagnostic purposes, existing exhaust flange gaskets may be re-used. Any time the exhaust pipe is removed, it should be reinstalled using new gaskets before returning the vehicle to service.

5.15. Disconnect the rear flange of the exhaust pipe from the muffler using two 13 mm wrenches. See Figure 5.15.

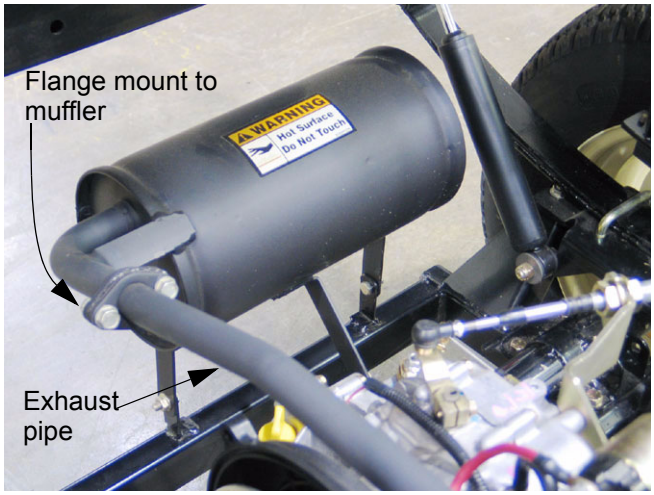

Figure 5.15

5.16. Disconnect the front flange of the exhaust pipe from the cylinder head using a 12 mm wrench. See Figure 5.16.

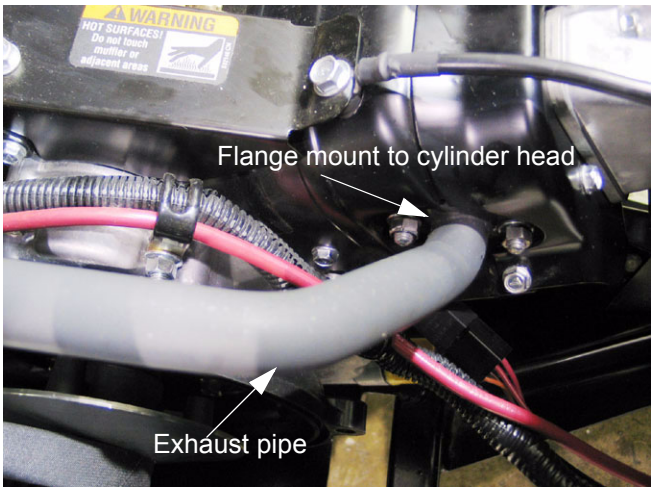

Figure 5.16

5.17. Remove the exhaust pipe.

5.18. Remove the 9 screws holding the CVT cover to the CVT housing using an 8 mm wrench, and maneuver the cover out of the engine compartment. See Figure 5.18.

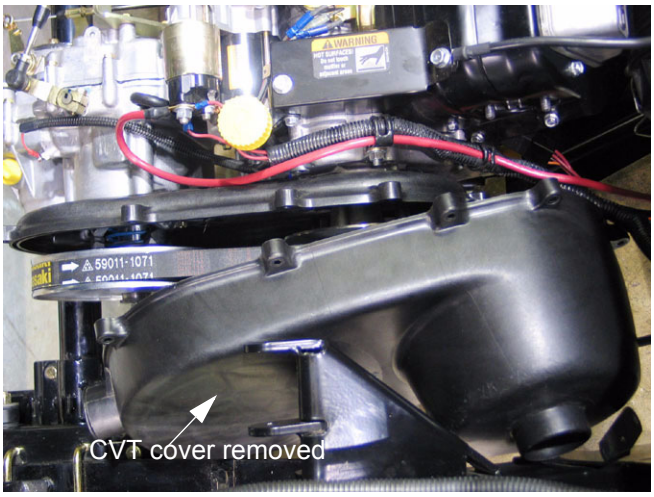

Figure 5.18

Poly Bed 4 X 2 Drive System

5.19. Inspect the belt and clutches (pulleys) for obvious damage and wear: See Figure 5.19.

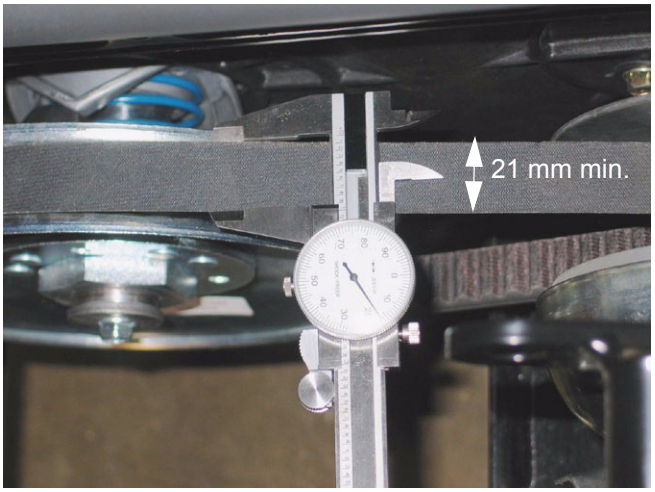

Figure 5.19

- The belt should measure at least.827” (21 mm) across the outside (wide) surface (service limit). If it measures less than this it is worn, and should be replaced.
- New belts should measure .906” (23 mm).
- Confirm that the correct belt is on the vehicle: Cub Cadet Part # 754-04054.
- The arrow printed on the belt should point in the direction of the belts rotation.

5.20. With the transaxle in neutral, it should be possible to rotate the driven pulley (on the transaxle) without applying a force of more than 20 in-lbs. (2.26 Nm) to the driving pulley (on the engine). See Figure 5.20.

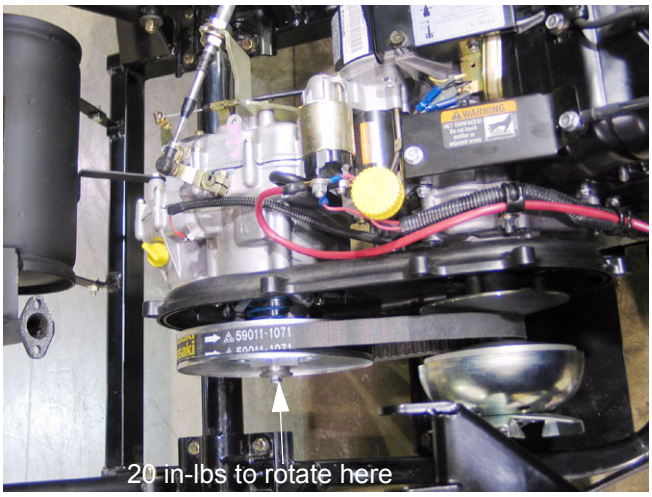

Figure 5.20

- A torque wrench with a 13 mm socket on it should read less than 20 in.-lbs.(2.26 Nm) while rotating the input shaft. The belt should slip easily on the driving pulley.
- If this figure is exceeded, remove the belt and repeat the test. This will confirm if the bind is internal or external.
- If the problem is internal, examine the transaxle, if the problem is external, examine the CVT.
- If there is excessive drag, and the outer sheave of the driving pulley is fully retracted, there may be an alignment or spacing problem between the crankshaft of the engine and the input shaft of the transaxle. If there is an alignment problem, it may be indicated by asymmetric wear on the belt.

5.21. The distance between the centerline of the crankshaft and the centerline of the input shaft should be 9.41” (23.9 cm). The two shafts must be parallel in vertical and horizontal axis.

NOTE: As a practical matter, this is a difficult measurement to make without specialized fixtures. A combination of measurement, adjustment, and experimentation may be necessary in the field.

5.22. To check the performance of the CVT, install the exhaust pipe, but leave the CVT exposed for observation.

5.23. Connect a tachometer to the engine.

5.24. With the vehicle in neutral, insure that no unsafe conditions will arise from starting the engine.

NOTE: Perform the following procedure with all due caution to ensure that no foreign objects, including the technician, come into contact with rotating components.

5.25. Confirm that the throttle cable, and the travel stops on the throttle cable are adjusted to provide the full range of travel without straining the cable:

5.26. There should be roughly 3/16” (4.8 mm) of play at the eyelet that connects the throttle cable to the throttle pedal. See Figure 5.26.

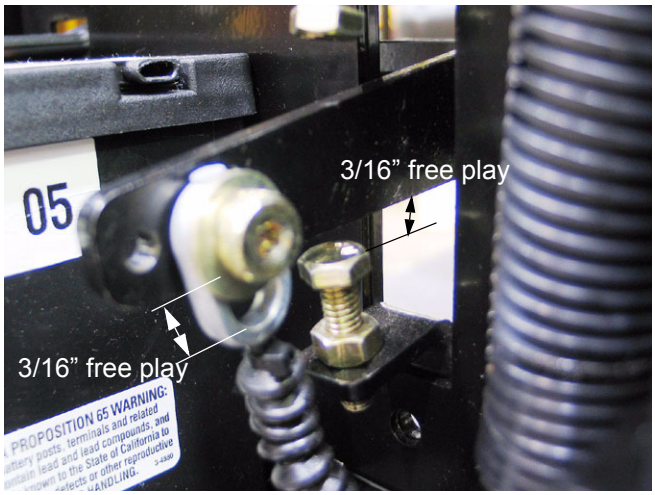

Figure 5.26

5.27. The throttle pedal arm should reach the end of its available travel, as set by the stop-bolt and jam nut as the governor linkage reaches the end of its travel at the engine end of the cable. See Figure 5.27.

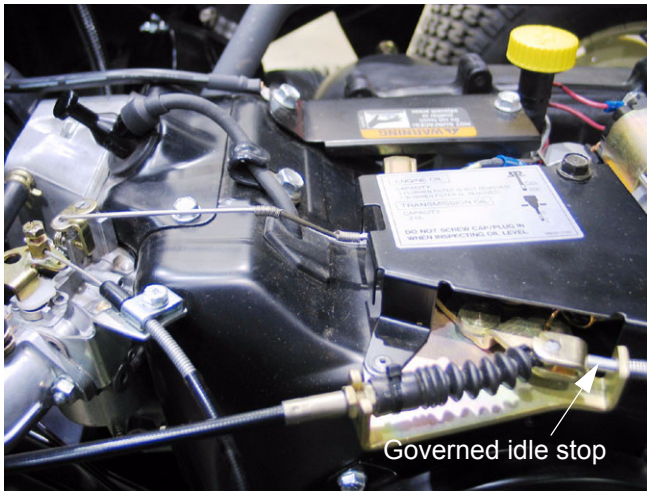

Figure 5.27

- The adjustment can be made through a combination of stop bolt (1/2” wrench) and throttle cable position (two 10 mm wrenches).
- Too little pedal travel in comparison to available cable travel will result in sub-optimal engine performance.
- Too much pedal travel, in comparison to available cable travel will “load” the linkage, and may damage components through bending or fatigue.
- Tension on the cable when the pedal is at rest, or a cable that fails to return all the way to idle position may cause an artificially high idle speed.

5.28. Start the engine and check the idle speed controlled by the stop-screw on the throttle arm of the carburetor. See Figure 5.28.

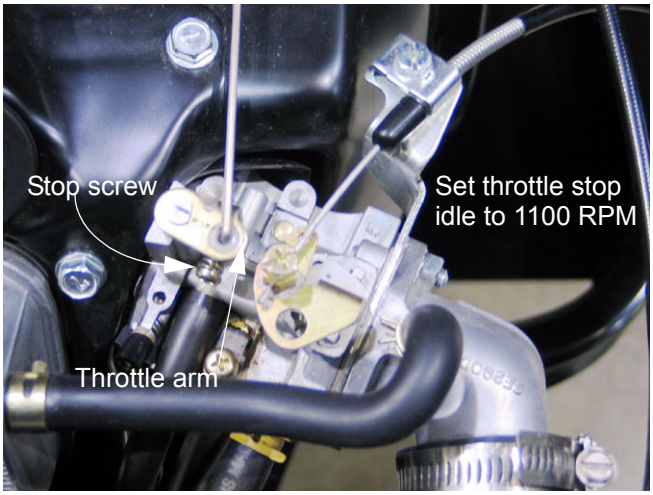

Figure 5.28

NOTE: The engine should be fully warmed-up prior to this adjustment. Engine temperature has a significant effect on idle speed.

Poly Bed 4 X 2 Drive System

5.29. Hold the throttle arm against the stop screw. Adjust the stop screw to set the engine speed to 1,100 RPM ± 50.

5.30. Release the throttle arm, then set the governed idle speed to 1,200 RPM ± 50. See Figure 5.30.

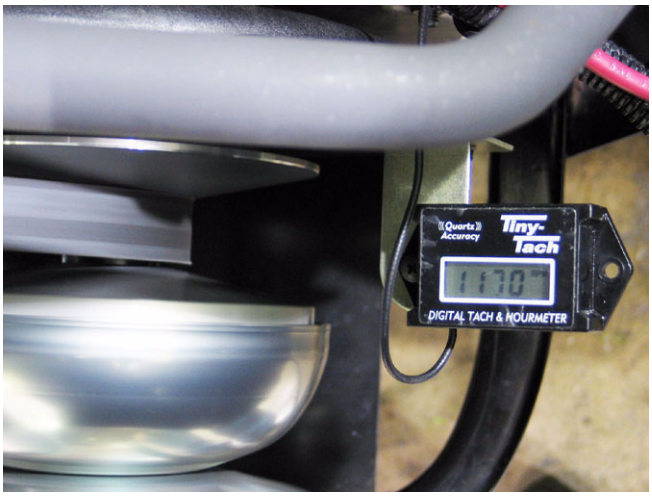

Figure 5.30

5.31. The idle speed is controlled by the phillips head screw on the governor control panel. See Figure 5.31.

Figure 5.31

NOTE: If the idle speed is set too high, the driving pulley will begin to apply force to the belt. This will turn the input pulley of the transaxle with enough force to cause gear clash when forward or reverse gear are engaged, and it may cause difficulty in disengaging drive gears.

NOTE: If the idle speed is set too low, the engine will stall at idle. If warm idle speed has fallen with time, check the condition of engine tune-up factors (compression, valve lash, spark plug, air filter) before making adjustment.

5.32. Gradually increase the speed of the engine (manually, not through adjustment), and observe the point where the outer sheave of the driving pulley moves in to compress against the belt. See Figure 5.32.

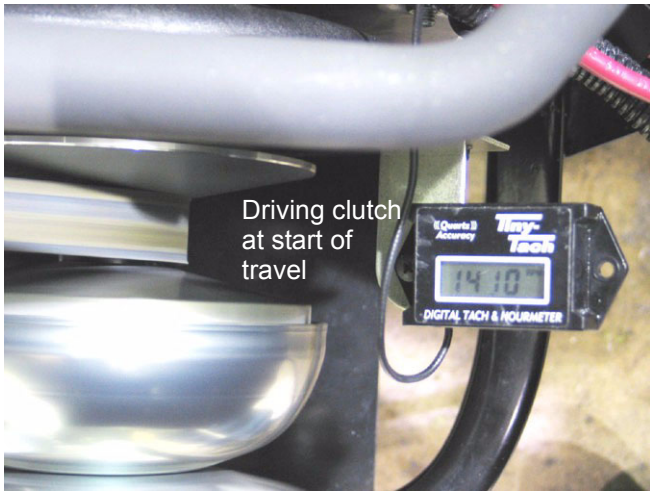

Figure 5.32

5.33. The belt should be squeezed between the sheaves at 1,400 ± 100 RPM.

5.34. By 3,300 ± 100 RPM the outer sheave of the driving pulley should be fully extended. See Figure 5.34.

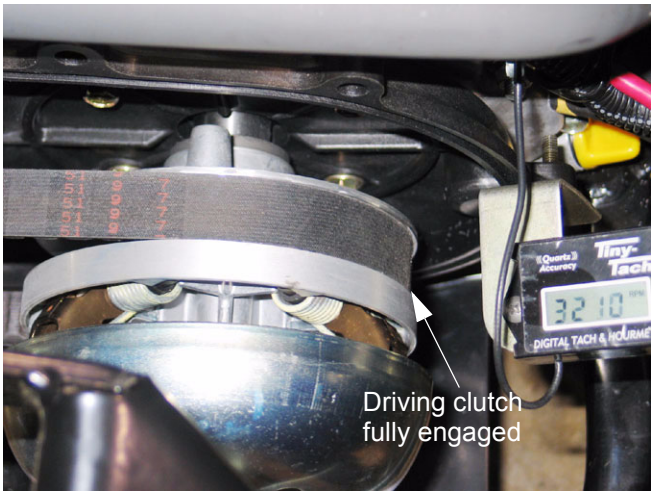

Figure 5.34

5.35. As the driving pulley compresses the belt, it is forced outward in the tapered sheave.

NOTE: As the effective diameter of the driving pulley increases, the belt is drawn deeper into the sheave of the spring loaded driven pulley, reducing its effective diameter. The combined effect changes the drive ratio as speed goes up.

NOTE: Because the outer sheave of the driving pulley is fully extended by around 3,300 RPM, any vehicle speed increase beyond 3,300 RPM engine speed is due directly to increases in engine RPM, not to shifts in the effective drive ratio.

5.36. If the vehicle fails to reach full speed (20 MPH) or has lost performance, and the belt is good, confirm that the engine still achieves it's specified top-no-load speed and that the CVT responds accordingly.

5.37. Top-no-load engine speed should be 4,000 ± 50 RPM. Confirm this with a tachometer. See Figure 5.37.

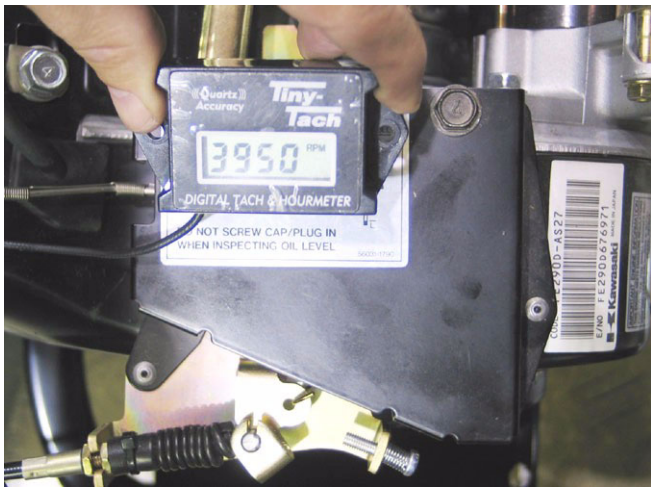

Figure 5.37

NOTE: The governor cover is riveted to the control plate. It is not adjustable.

5.38. If the engine fails to reach the specified top no-load speed, or lacks performance under a light load, check engine performance factors as described in the Engine section of this manual:

- Ignition function and spark plug condition.
- Fuel system condition (fuel pump and lines, fuel filter, air filter, carburetor, linkages).
- Engine mechanical condition (valve lash adjustment, cylinder compression, cylinder leakdown).

CVT Removal: Belt and Pulleys

5.39. Remove the exhaust pipe and CVT cover as described previously in this section.

NOTE: If the belt is to be removed, but the pulleys are to be left in-place, it is not necessary to remove the exhaust pipe. The CVT cover can be moved aside, and the belt slipped-out. The CVT cover does not need to be completely removed to change a belt.

5.40. Disconnect and ground the spark plug H.T. lead.

5.41. If the pulleys are to be removed, loosen the bolts that hold the pulleys to their respective shafts before removing the belt.

NOTE: The bolts securing both CVT pulleys are **left hand thread**. Turn them clockwise to loosen them.

5.42. The driven pulley on the input shaft of the transaxle can be removed using a 12 mm wrench. Use an adjustable face pin spanner with reach of at least 3" (7.62 cm) and a 1/4" (6 cm) pin size (Snap-On stock number AFS483 is suitable) to keep the pulley from rotating. See Figure 5.42.

Figure 5.42

- Setting the parking brake will also help.
- If no other means are available, the pulley can be held with a 2" (50 mm) wrench on the large nut.

5.43. The bolt holding the driving pulley to the engine crankshaft can be loosened using a 14 mm wrench.

Poly Bed 4 X 2 Drive System

5.44. If it is necessary to hold the crankshaft from turning: choose one of three methods. See Figure 5.44.

- Remove the spark plug using a 13/16” (21 mm) wrench. With the piston rising on the compression stroke pack the cylinder with starter rope to act as a piston stop.
- Remove the flywheel cover using 10 mm wrench, and hold the flywheel nut using a 22 mm wrench.
- Use a strap wrench on the driving pulley.

Figure 5.44

5.45. Tug upward on the top run of the belt. This will spread the sheaves of the driven pulley, and create enough slack in the belt to allow easy removal. See Figure 5.45.

Figure 5.45

5.46. Roll the belt off of the driven pulley on the transaxle. See Figure 5.46.

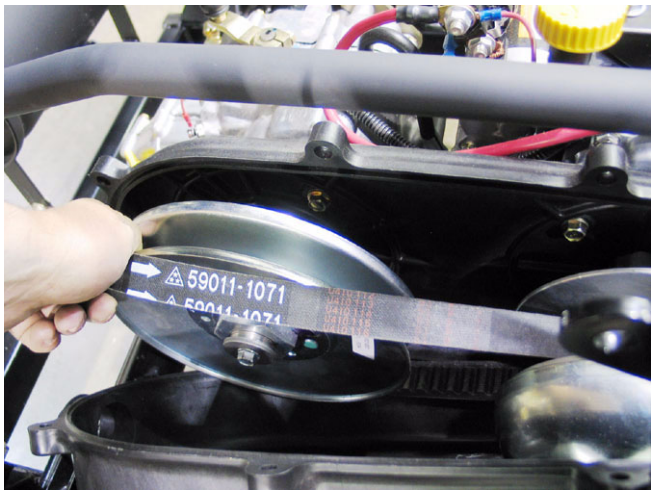

Figure 5.46

5.47. To remove the driven pulley, begin by removing the bolt that holds it to the input shaft of the transaxle using a 3/4” wrench.

NOTE: If an impact wrench is not available, it may be necessary to manually place the transmission in Forward gear and set the parking brake.

5.48. Carefully roll the drive belt off of the driven pulley, then remove it from the driving pulley. See Figure 5.48.

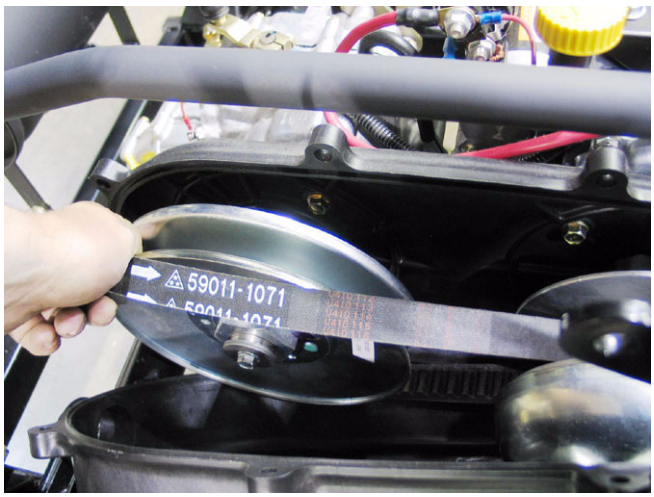

Figure 5.48

5.49. Reverse the process for installation.

NOTE: The arrow on the belt points in the direction of travel.

5.50. After the belt is removed, the driven pulley can be removed: See Figure 5.50.

- Take the bolt and washer that secure the pulley onto the transaxle input shaft completely off using a 12 mm wrench.
- Slide the pulley off of the input shaft. It may be necessary to carefully pry on the pulley hub.
- There is a key between the pulley and the input shaft, and a spacer between the pulley and the shoulder on the input shaft.

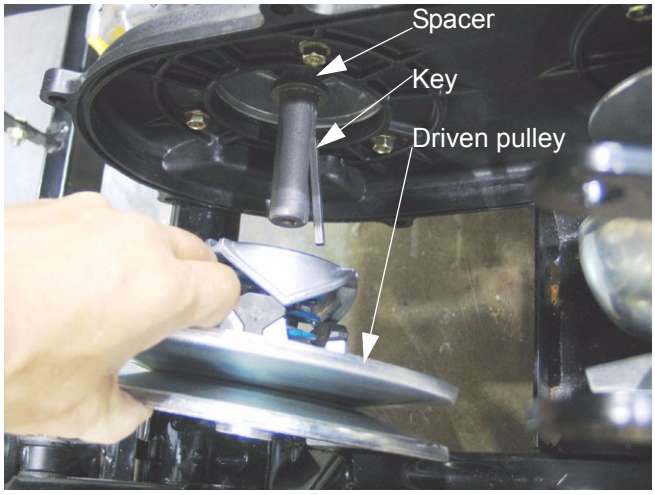

Figure 5.50

5.51. If the driven pulley does not function properly, replace it as a complete unit.

5.52. On installation:

- Apply a small amount of anti-seize compound to the input shaft.
- Confirm that the spacer and key are properly positioned. The chamfered side of the spacer should face the shoulder on the crankshaft.
- Slip the driven pulley all the way onto the input shaft, and seat it against the spacer.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolt.
- Secure the pulley to the input shaft with the bolt and washer. Tighten the bolt to a torque of: 24 ft-lb (32 N-m).

5.53. Key points to inspect on the driven pulley are the ramp surfaces on the cams, and the polymer buttons that ride against the ramps.

5.54. After the belt is removed, the driving pulley can be removed: See Figure 5.54.

- Remove the bolt and washer securing the driving pulley to the engine crankshaft using a 14 mm wrench.
- Slide the driving pulley off of the crankshaft.
- There is a key between the pulley and the input shaft, and a spacer between the pulley and the shoulder on the crankshaft. The spacer is notched to fit over the key.

Figure 5.54

5.55. If the driven pulley does not function properly, replace it as a complete unit.

5.56. On installation:

- Apply a small amount of anti-seize compound to the crankshaft.
- Confirm that the spacer and key are properly positioned. The chamfered side of the spacer should face the shoulder on the crankshaft. The key should fit through the notch in the spacer.
- Slip the driven pulley all the way onto the input shaft, and seat it against the spacer.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolt.
- Secure the pulley to the input shaft with the bolt and washer. Tighten the bolt to a torque of: 31 ft-lb (42 N-m).

5.57. Beyond the warranty period, if a dealer chooses to service a driven clutch, service information and specialized tools are available from:

Hoffco/Comet Industries
358 NW F Street
Richmond, IN 47374

5.58. The CVT housing connects the engine to the transaxle. It can be removed using a 12 mm wrench. See Figure 5.58.

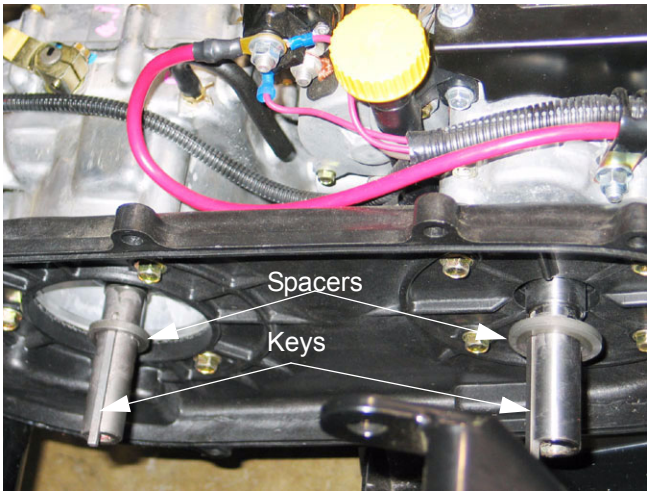

Figure 5.58

5.59. If the engine or transmission has been removed, the CVT housing can be used as a guide to align them. An assembly jig (P/N: 57001-1341) is available from Kawasaki.

5.60. Apply a small amount of thread locking compound such as Loctite 242 (blue) to the 7 bolts that hold the CVT housing in place prior to installation. Tighten the bolts to a torque of 160 in-lb (18 N-m).

5.61. Complete assembly, connect spark plug H.T. lead, and thoroughly test operation in an area that is clear of obstacles and hazards before returning the vehicle to service.

6. TRANSAXLE REMOVAL AND REPLACEMENT

The transaxle is carried on the engine/transaxle cradle, and the entire cradle moves up and down with the travel of the suspension. It pivots on a dog-bone joint to allow for some degree of axial twist in relation to the rest of the chassis, as well as up and down travel. The engine and transaxle cradle maintains correct alignment and spacing between the engine and the transaxle. The transaxle also mounts directly to the leaf springs.

6.1. Park the utility vehicle on firm level ground where there is sufficient room to work around the sides and rear of the vehicle. Set the parking brake.

6.2. Unlatch the hood and tilt it forward. It may be removed completely at the technician's discretion.

6.3. Disconnect the negative battery cable using a 7/16" wrench.

6.4. Place a drain pan beneath the transaxle, and remove the drain plug using a 17 mm wrench. See Figure 6.4.

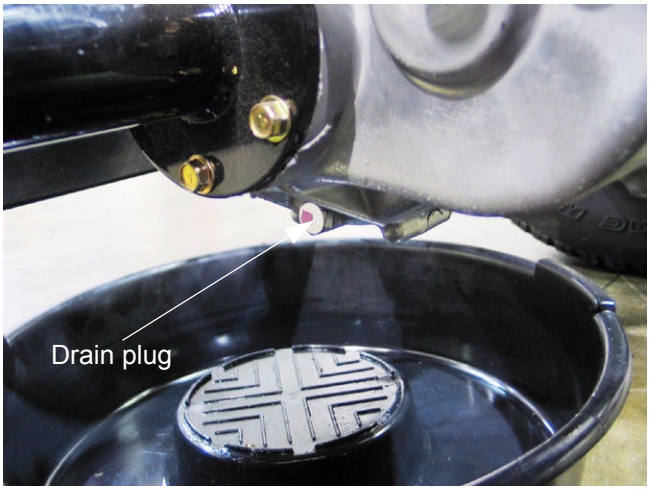

Figure 6.4

NOTE: Removing the fill plug/dipstick will speed the draining process.

6.5. If working without an impact wrench: loosen the lug nuts on the rear wheels 1/2 turn each using a 19 mm wrench.

6.6. Lift the bed. Remove the exhaust pipe and the CVT assembly, including the housing, as described in the CVT section of this manual. See Figure 6.6.

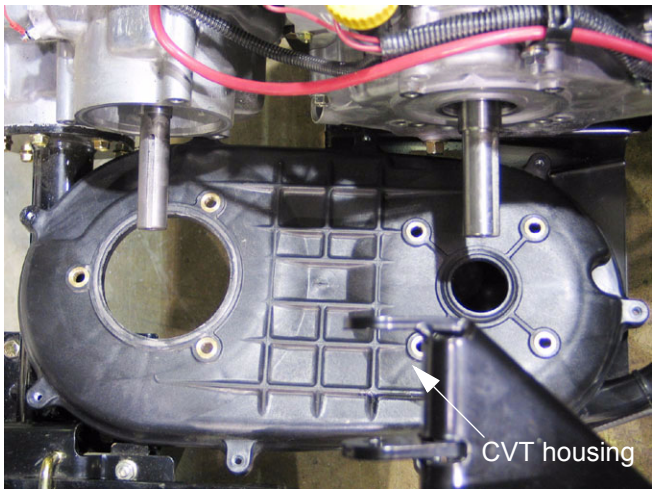

Figure 6.6

6.7. Index the forward-neutral-reverse shift arm on the transaxle to the splined shaft that it mounts to. Remove the clamp bolt that secures it using a 10 mm wrench.

6.8. Remove the two bolts that hold the shift cable bracket to the transaxle using a 12 mm wrench. See Figure 6.8.

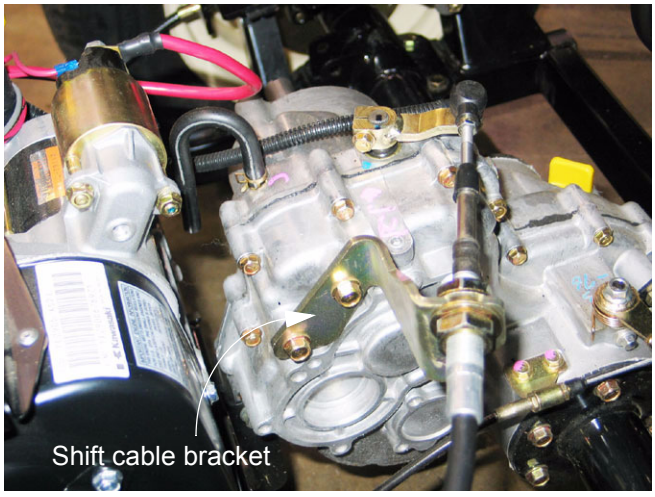

Figure 6.8

6.9. Remove the shift arm from the shaft, and move the cable out of the way.

6.10. Remove the two bolts that hold the differential lock cable bracket to the transaxle using a 10 mm wrench. There will be enough slack in the cable to permit the barrel end to be disengaged from the differential lock arm on the transaxle. See Figure 6.10.

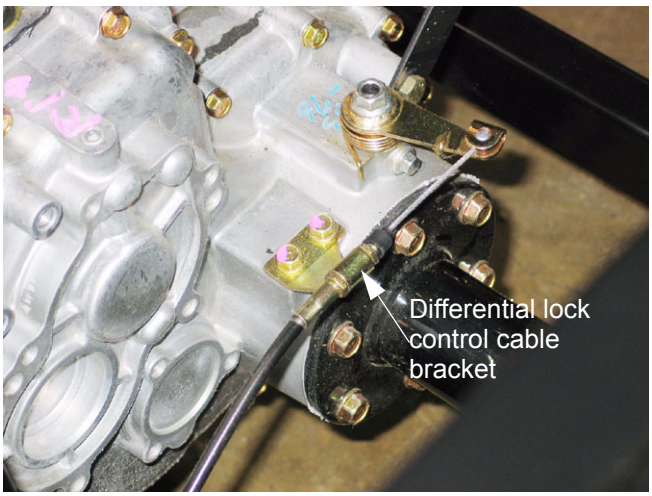

Figure 6.10

6.11. Unbolt the muffler from the frame using a pair of 1/2" wrenches. Unbolt the muffler from the transaxle using a 13 mm wrench. See Figure 6.11.

Figure 6.11

6.12. Release the parking brake.

Poly Bed 4 X 2 Drive System

6.13. Remove and discard the cotter pins securing the clevis pins into each brake cable clevis/actuator arm connection. Remove the clevis pins. See Figure 6.13.

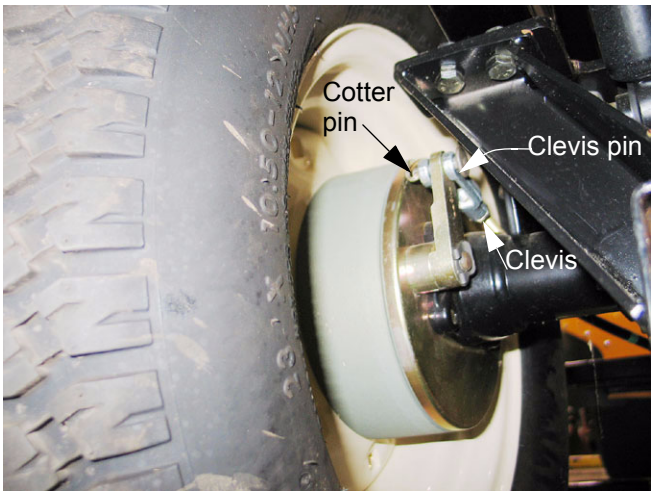

Figure 6.13

6.14. Disconnect the red wire with white trace from the neutral switch, located on the rear surface of the upper portion of the transaxle housing. The nut that secures the eyelet to the stud can be removed using a 7 mm wrench.

6.15. Remove the bolt holding the front of the transaxle to the torque bracket using two 9/16" wrenches. See Figure 6.15.

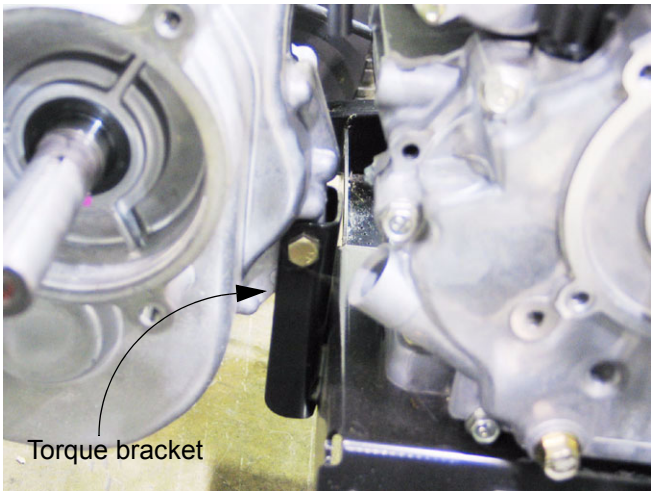

Figure 6.15

6.16. Remove the bolts that fasten the spring mounts to the engine and transaxle cradle using a pair of 1/2" combination wrenches. See Figure 6.16.

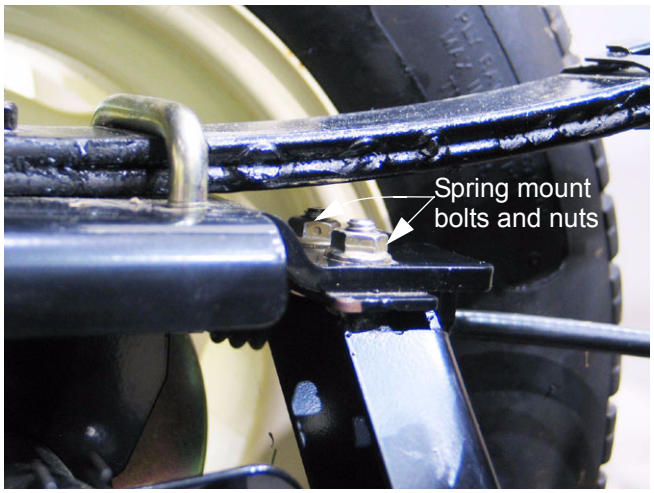

Figure 6.16

NOTE: On each side of the cradle there are two pedestals: one in front of the axle tube, and one behind. Two bolts fasten each pedestal to the front or rear of a spring mount.

6.17. Install the drain and fill plugs, remove the drain pan and lower the bed.

6.18. Lift and safely support the rear of the vehicle. See Figure 6.18.

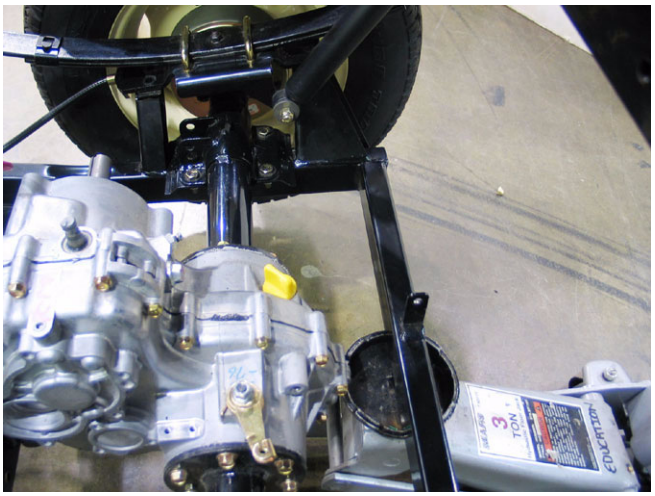

Figure 6.18

NOTE: Lift the vehicle by the rear cross-member of the engine and transaxle cradle.

6.19. Jackstands must be placed under the frame, not the engine/transaxle cradle. See Figure 6.19.

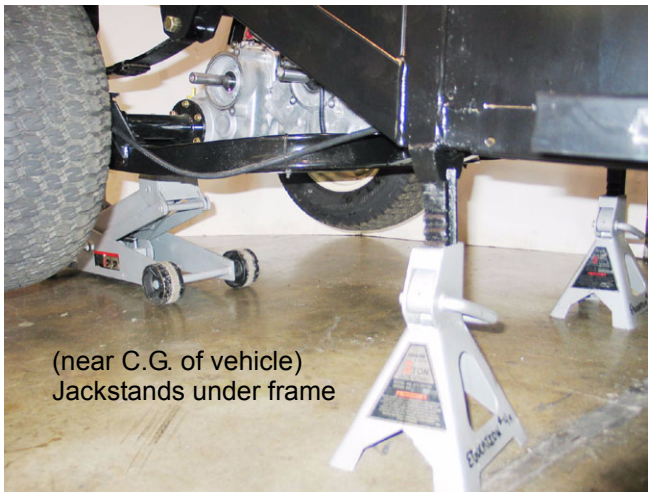

Figure 6.19

NOTE: The cross member that the bracket for the dog-bone joint is attached to provides a convenient place for jackstands. It is near the center of gravity: the entire vehicle will usually balance on two jackstands at this location. Because of the teeter-totter effect, the rear wheels will be left on until the transaxle is removed.

6.20. Remove the bolts that hold the axle tubes to the engine/transaxle cradle using a pair of 9/16" wrenches. See Figure 6.20.

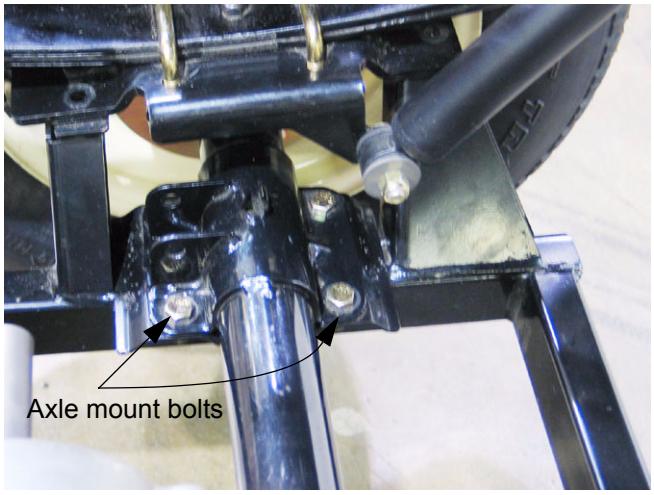

Figure 6.20

6.21. Carefully lower the engine and transaxle cradle, until the wheels touch the ground. See Figure 6.21.

Figure 6.21

NOTE: While the transaxle is partially supported by the cradle, it will remain up-right.

6.22. With a firm grip on the transaxle, lower the jack completely, tip the front of the transaxle up so that the housing clears the back of the cradle, and roll the transaxle clear of the cradle on it's own two wheels. See Figure 6.22.

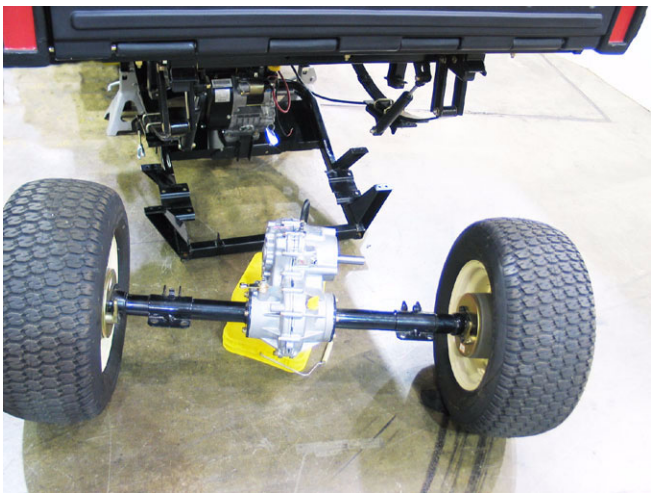

Figure 6.22

6.23. With the transaxle completely removed, the Big Country will be stable on the jackstands.

7. TRANSAXLE INSTALLATION NOTES:

7.1. Reverse the removal procedure to install the transaxle. The following items are tips, reminders, and torque specifications.

7.2. When mounting the transaxle to the cradle:

- Roll the transaxle into position.
- Attach it loosely to the cradle using the eight bolts through the brackets on the axle tubes.
- Lift the cradle into place against the spring mounts, and attach it loosely with eight bolts removed from these attachment points.
- Position the front of the transaxle in the torque bracket and loosely install the bolt that secures it.
- Fasten the CVT housing to the transaxle and the engine.
- Confirm the correct span between the input shaft and the crankshaft, and confirm that the two shafts are parallel in vertical and horizontal planes. The distance between the two shafts should be 10.35” (26.28 cm).

  NOTE: Two small magnetic squares and a straight-edge can be used to check for parallelism.
- Once accurately in position, tighten all of the fasteners. (See torque table)
- After tightening, double-check poisoning, to confirm that the parts have not shifted.

7.3. Connect the differential lock cable and attach the differential lock bracket to the transaxle.

- Confirm correct operation of the differential lock shift mechanism.

7.4. Connect the forward-neutral-reverse shift arm to the splined shaft on the transaxle:

- Align the index marks made before removal.
- Secure the arm with the pinch bolt.

7.5. Connect the clevises on the ends of the brake cable to the brake actuating arms using clevis pins and new cotter pins.

- Lubricate the clevis pins lightly with anti-seize compound or white lithium grease.
- Replace the clevis pins if they show signs of wear.

7.6. Install the CVT:

- Apply a small amount of anti-seize compound to the input shaft and the crankshaft.
- Install the appropriate spacers on the input shaft and crankshaft, and install the appropriate keys in the keyways on the shafts.

  NOTE: The drive belt may be postponed on the pulleys, and installed simultaneously, or it may be rolled-on after the pulleys are installed.
- Install the driving and driven pulleys on the crankshaft and input shaft, and secure them with the washers and left-hand thread bolts.
- Install the belt.
- Install the CVT cover.

7.7. Confirm that the drain plug is tight.

7.8. Fill the transaxle with 68 fl.oz.(2 liters) of API “GL5” Hypoid gear oil, or confirm the presence of the correct amount of appropriate gear lube using the dipstick:

- SAE 90 above 41 deg. f. (5 deg. c.)
- SAE 80 below 41 deg. f. (5 deg. c.)

7.9. Check the torque on the lug nuts.

7.10. In a safe area that is free of obstacles and hazards, check the drive system and brakes for correct operation before returning the vehicle to service.

Table 1: Drive System Torque Values

Item	Torque	Note
cradle to axle tubes	17 ft-lb 21 N-m	1
cradle to spring mounts	31 ft-lb 42 N-m	2
torque bracket	31 ft-lb 42 N-m	2
CVT cover	48 in-lb 5.5 N-m	
CVT housing	160 in-lb 18 N-m	
driving pulley	31 ft-lb 42 N-m	3
driven pulley	24 ft-lb 32 N-m	3
diff. lock cable bracket	78 in-lb 8.8 N-m	
shifter cable bracket	18 ft-lb 25 N-m	
shifter control arm	78 in-lb 8.8 N-m	
lug nuts	25 ft-lb 34 N-m	
drain plug	11 ft-lb 15 N-m	

NOTE: 1 May be inaccessible with torque wrench.

NOTE: 2 If locking feature on nut is worn, replace the nut or apply releasable thread-locking compound such as Loctite 242 (blue).

NOTE: 3 Left-hand threads

8. LINK ASSEMBLY

8.1. The link assembly (aka:dogbone joint) connects the engine and transaxle cradle to the frame of the Big Country. This joint locates the front of the cradle, yet allows enough freedom of movement that the cradle can swing up and down and pivot to accommodate suspension travel. See Figure 8.1.

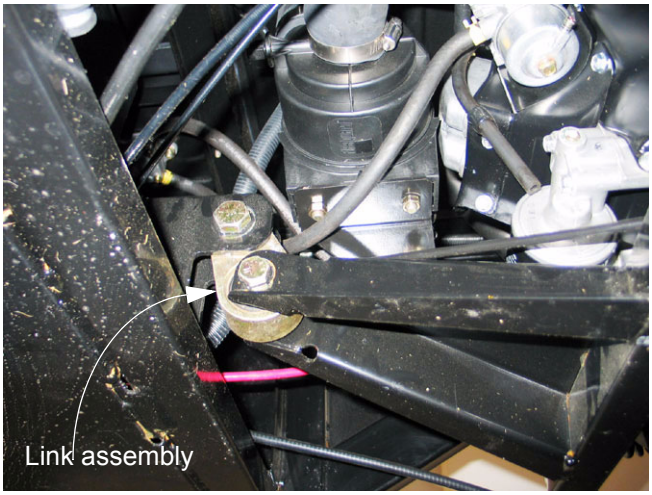

Figure 8.1

8.2. If the link assembly becomes worn or damaged, the front of the engine and transaxle cradle may shift and clunk, particularly when acceleration or braking load is applied. To replace the link assembly, use the following procedure:

8.3. Tilt the passenger seat forward, and lift out the parcel bin. This will provide easy access to the link assembly fasteners.

8.4. Open the hood, and disconnect the negative battery cable. Tools will be in close proximity to the “hot” stud on the starter motor.

8.5. It is not absolutely necessary to support the front of the engine and transaxle cradle with a jack, but it may make it easier to relieve any bind on the bolts that connect the cradle, link assembly, and frame.

8.6. Remove the nut and bolt (top) that connect the link assembly to the frame using a pair of 15/16" wrenches. See Figure 8.6.

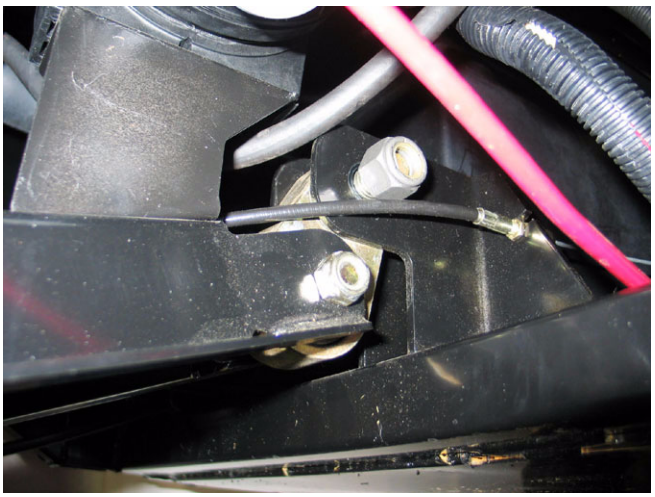

Figure 8.6

8.7. Remove the nut and bolt (bottom) that connect the link assembly to the engine and transaxle cradle using a pair of 19mm wrenches.

8.8. With the bolts removed, the link can be lifted out and replaced. See Figure 8.8.

Figure 8.8

8.9. Installation notes:

- Apply anti-seize compound to the bolts so that they may be easily removed in the future.
- Tighten the top nut and bolt to a torque of 100 ± 10 ft.-lbs.
- Tighten the bottom nut and bolt to a torque of 40 ± 5 ft.-lbs.

9. TRANSAXLE REPAIRS

Axle Assemblies:

NOTE: It is possible to replace axle bearings and seals without removing the transaxle from the vehicle. If this is done, inspect the axle tubes carefully. If the axle tubes have been bent by over-loading the suspension (static or shock) then a mis-alignment of the bearings may have occurred. This misalignment will cause the rapid demise of the replacement bearings. Overloading constitutes abuse of the vehicle. The resultant damage is NOT warrantable.

NOTE: If the transaxle is being removed with the anticipation of disassembly, steps can be saved in the removal process by leaving the brake drums and wheels attached to each other:

9.1. Remove and discard the cotter pins that secure the castle nuts on the end of each axle shaft.

9.2. Set the parking brake, and remove the castle nuts and washers using a 27 mm socket. See Figure 9.2.

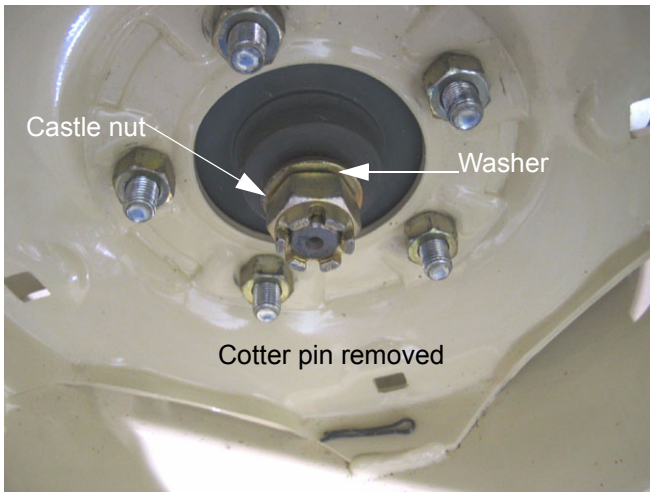

Figure 9.2

9.3. Release the parking brake, and remove the transaxle assembly as described in the "Transaxle Removal" portion of this manual.

9.4. Slide the brake drums off of the axle shafts without removing them from the wheels.

9.5. After the wheels and brake drums are removed from the axle shafts, remove the brake shoes as described in the “Brakes” section of this manual. See Figure 9.5.

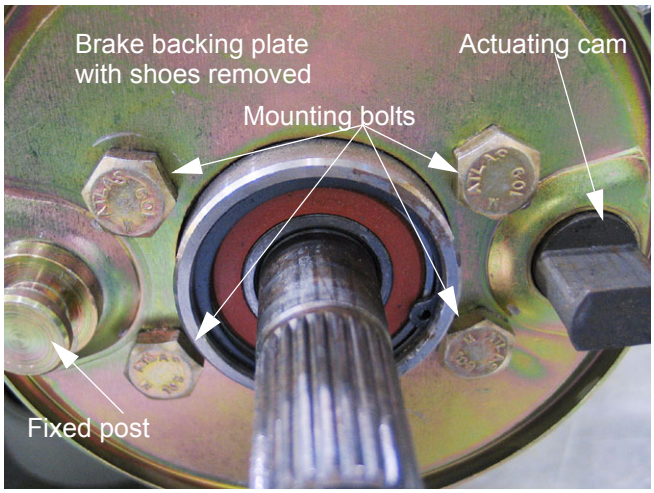

Figure 9.5

9.6. Remove the Brake backing plate assembly from the transaxle using a 17 mm wrench. See Figure 9.6.

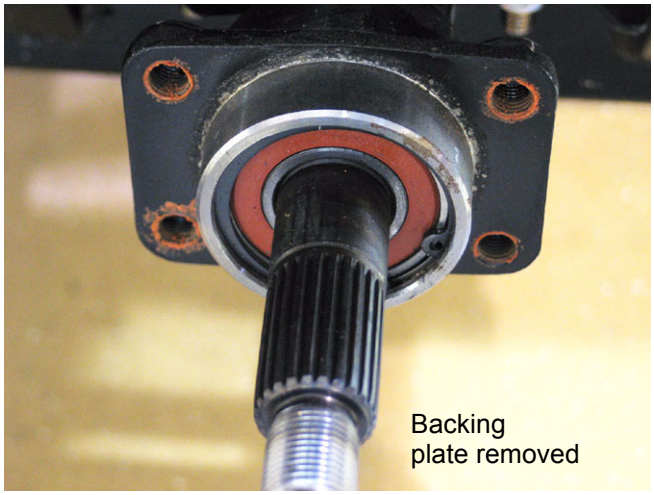

Figure 9.6

NOTE: This step is not strictly necessary, depending on the repairs that are to be performed, but makes the transaxle easier to maneuver on the bench.

9.7. Though it is not likely to require disassembly during brake or transaxle service, it is worth noting that the backing plate is an assembly. See Figure 9.7.

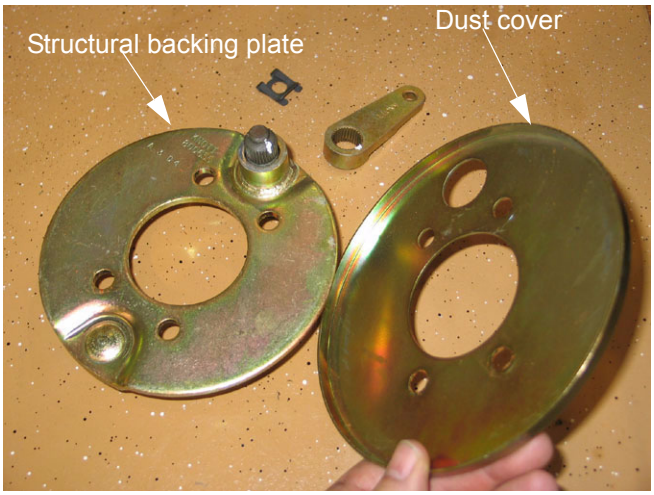

Figure 9.7

9.8. The cam can be removed from the backing plate. See Figure 9.8.

Figure 9.8

9.9. When placed on the bench, take note of the orientation of the transaxle components. Match marks will ease the assembly process but the following relationships are correct:

- The brake backing plates attach with the lever and cam to the rear of the transaxle.
- The shock absorber mounts on the axle tubes go toward the front of the transaxle.
- The spring perches are off-set toward the bottom of the axle tubes.
- The mounting surfaces of the spring perches should be parallel to the flat mounting surface for the shift cable bracket.
- The left hand side (differential lock side) axle tube is shorter than the right hand side (input shaft side) axle tube.

9.10. Remove the vent tube from the transaxle housing.

9.11. Remove the screw that locates the differential lock lever in the transaxle housing using an 8mm wrench. See Figure 9.11.

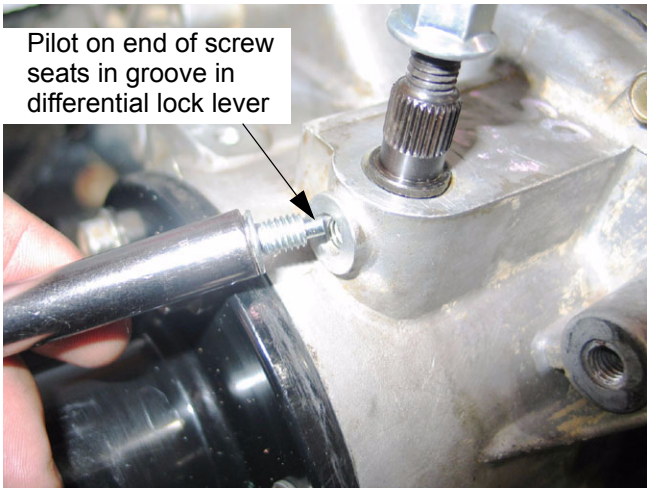

Figure 9.11

9.12. Remove the six bolts that secure the flange of each axle tube to the transaxle housing using a 12mm wrench. See Figure 9.12.

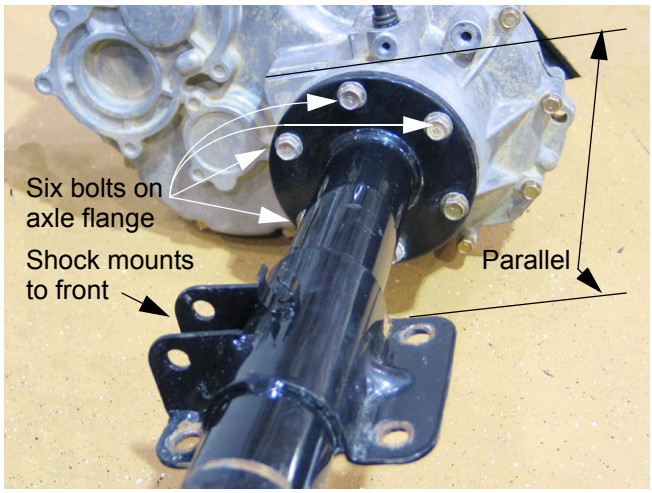

Figure 9.12

NOTE: Remove the axle tubes one at a time.

9.13. Shock the axle tube with a soft hammer, if necessary to break the sealant bond that may hold the axle tube to the housing, and separate the tube from the housing.

NOTE: The axle shaft may or may not come out with the tube. Neither situation presents a problem.

9.14. The left side axle shaft passes through the differential lock collar. The dogs on the collar are driven by dogs on the differential when the differential lock is engaged. See Figure 9.14.

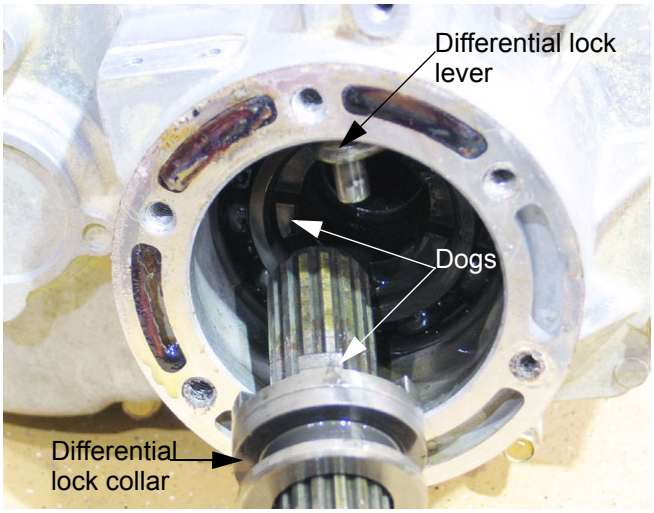

Figure 9.14

9.15. The axle shaft will slip out of the collar. The groove on the collar engages the pin on the shift arm

9.16. The axle shafts should slip-out through the end of the axle tube that was connected to the tran-saxle housing. See Figure 9.16.

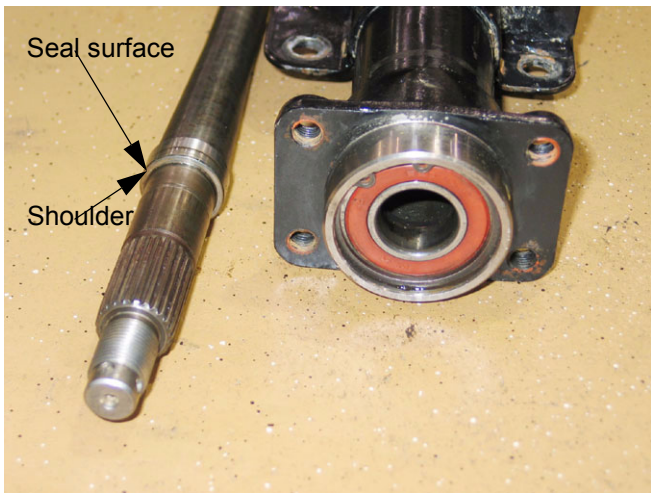

Figure 9.16

9.17. To take apart the axle assemblies, remove the circled that holds the sealed bearing in the end of each axle tube. See Figure 9.17.

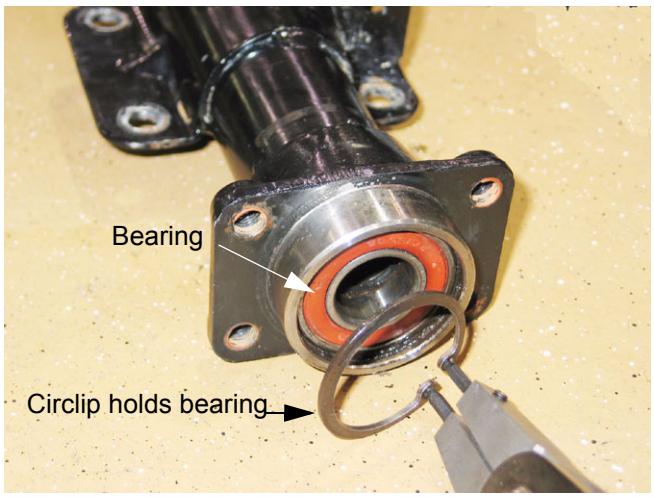

Figure 9.17

9.18. If the axle shaft is stuck in the inner race of the bearing, the right side shaft can be removed with the bearing. See Figure 9.18.

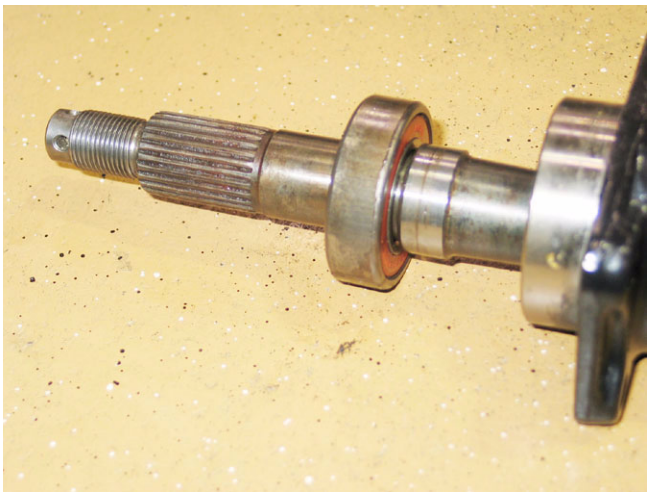

Figure 9.18

9.19. The left side axle shaft is thicker in cross section to the inside of the seal surface than the right side axle is. The right side axle will not fit through the seal that is behind the bearing. See Figure 9.19.

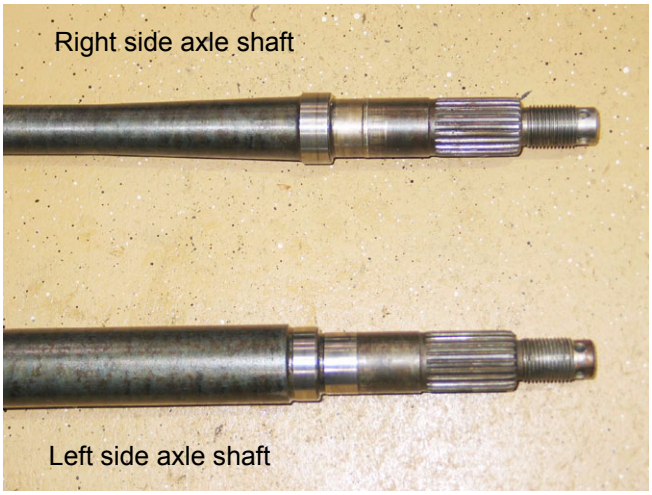

Figure 9.19

NOTE: If the bearing in the right side axle shaft is stubborn, the left side axle can be used to force it out. Use caution not to damage the ends of the axle.

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9.20. Remove the seal from the axle tube. See Figure 9.20.

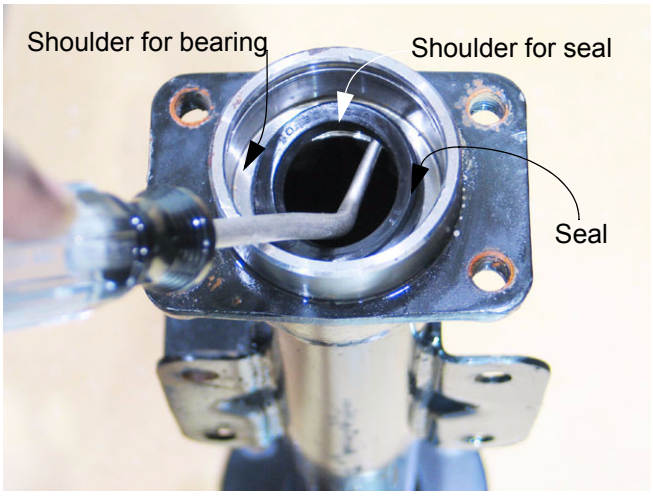

Figure 9.20

NOTE: The oil seal seats against a shoulder in the tube. Hook the seal removal tool under the lip of the seal to avoid scratching the bore that the seal fits in.

9.21. **Technical Info. for the Curious**: See Figure 9.21.

Figure 9.21

- The weakest part of a splined shaft is at the root of the spline. That is the smallest cross-section of the shaft and the root of the spline creates stress risers.
- The right side axle is necked-down in the middle, to a size that is smaller than the root of the spline.
- The necked-down axle shaft spreads the force over a wider area, allowing the shaft to twist over a greater portion of its length when torque is applied to it. This reduces the load on the weakest part of the shaft: the root of the spline.

9.22. Clean the axle tubes, and inspect them for:

- Bends, cracks, or crushes.
- Scratches or damage to mating surfaces.

9.23. Check the bearings for damage: looseness and coarseness. Check the shafts for damage to the splines, threads, bearing seat, and seal surface.

9.24. To remove the differential lock arm from the transaxle housing, simply push it down into the bore. See Figure 9.24.

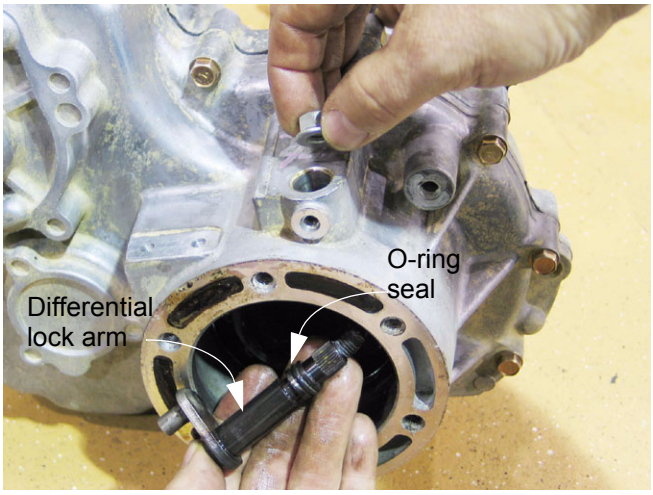

Figure 9.24

9.25. Remove and discard the O-ring seal in the upper groove on the differential lock arm.

NOTE: If the differential lock failed to disengage under the pressure of the torsion return spring, and the linkage moves freely, check the fit between the shaft of the arm and the bore.

NOTE: Symptoms of a differential lock stuck in the engaged position include squealing tires when making turns at even modest speeds on pavement, and complaints that the front end “plows” or the ability to turn the vehicle in tight quarters has diminished.

NOTE: Wear limits for differential lock shift mechanism:

- Maximum groove width is 9.2mm (.36”)
- Minimum shift pin diameter: 8.3mm (.33”)
- Dogs should not have rounded or broken teeth.

Transaxle housing and internals:

9.26. Prepare to separate the case: Clean any rust or burrs from the input shaft with emery cloth, and remove the spacer if it was not taken off previously. See Figure 9.26.

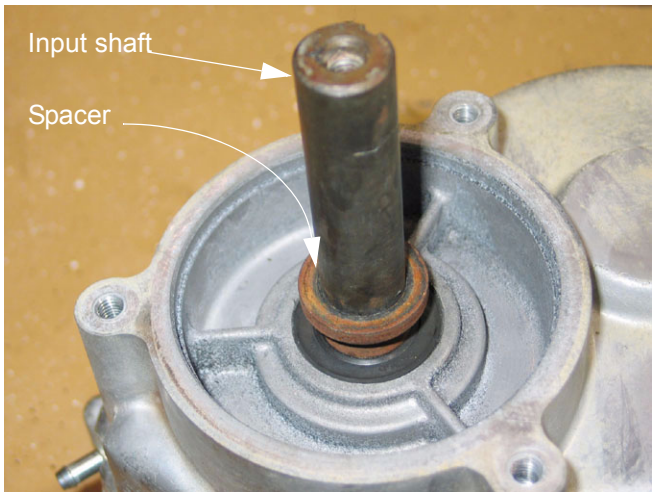

Figure 9.26

9.27. Position the case so that it rests securely with the input shaft down, and the perimeter bolts that hold the case halves together facing up.

NOTE: Supports are easily improvised from 4X4 dimensional lumber, or similar items.

9.28. Remove the 16 perimeter bolts using a 10 mm wrench. See Figure 9.28.

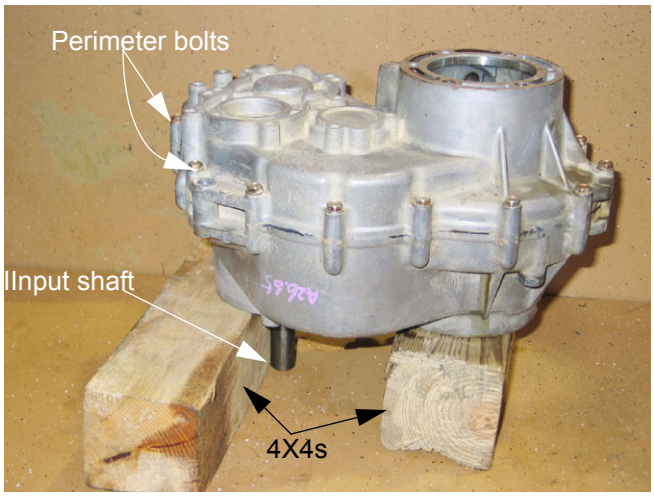

Figure 9.28

9.29. Use the pry-point recesses that are cast into the housings to separate the the two halves of the transmission case. See Figure 9.29.

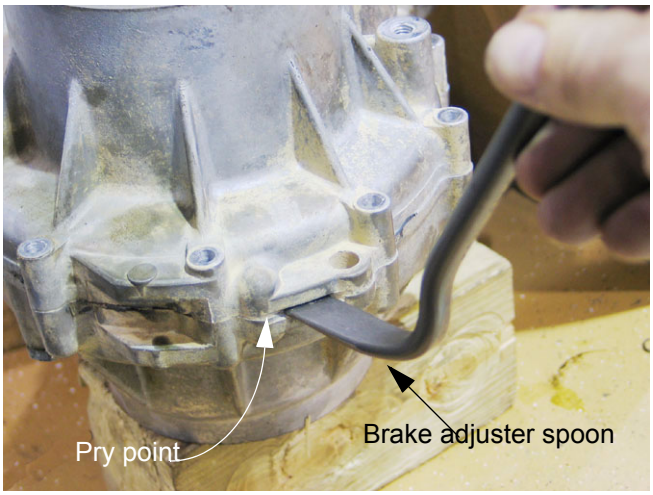

Figure 9.29

NOTE: Small pry-bars or brake adjustment spoons are handy for case separation.

9.30. Carefully lift away the right side half of the transmission housing. See Figure 9.30.

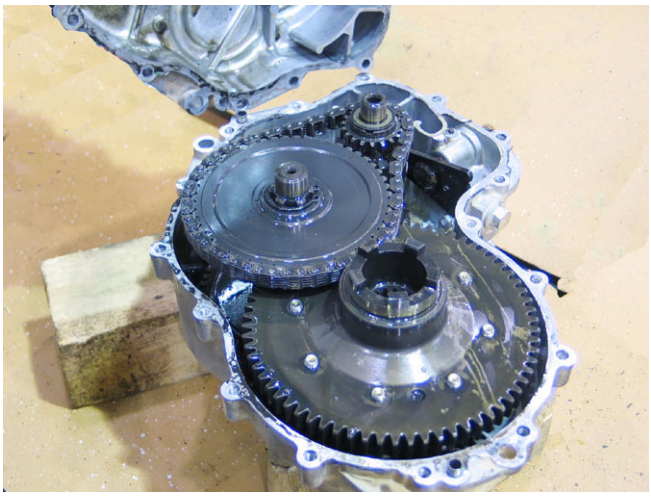

Figure 9.30

NOTE: Do not gouge the mating surface between the two halves of the housing.

NOTE: do not lose or damage the dowel pins that help align the two halves of the housing.

Poly Bed 4 X 2 Drive System

9.31. Clean the left half of the housing, and inspect the three bearings that reside in it. See Figure 9.31.

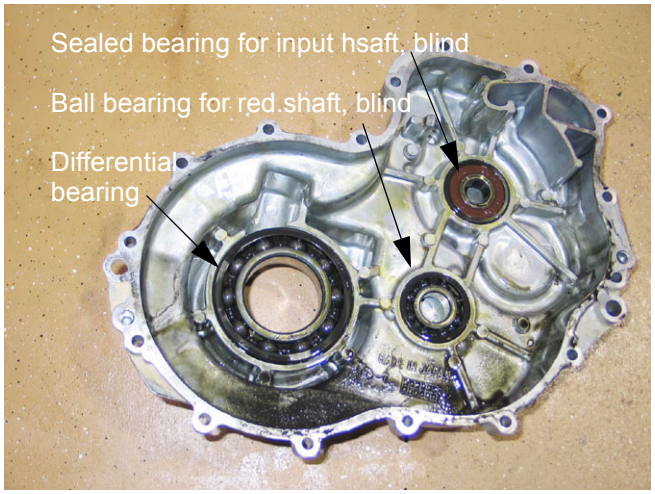

Figure 9.31

- The largest bearing supports the differential. It may be driven out of the housing from the out-side-in.
- The nose of the input shaft rides in a sealed bearing in a blind hole.
- The reduction shaft is supported by an open ball bearing in a blind hole.
- A blind bearing puller may be necessary to remove the input shaft bearing and the reduction shaft bearing.
- Heating the housing evenly to 200 degrees f. (93 deg. c.) will cause it to expand, making bearing removal and replacement easier. This should be done in an oven or by immersion in hot oil. Do NOT heat the housing with a torch. The un-even application of heat will cause it to distort.

9.32. Be certain to remove all of the cleaning solvent before heating the housing or reassembling the transaxle. See Figure 9.32.

Figure 9.32

- The solvent may be present hazards when heated.
- The solvent will severely contaminate the gear lube on assembly, causing a lubrication related transaxle failure.
- The solvent tends to get trapped behind the sealed bearing.

9.33. Remove the 25 mm circlip that secures the 51-tooth reverse sprocket to the reduction shaft using a pair of retaining ring pliers. See Figure 9.33.

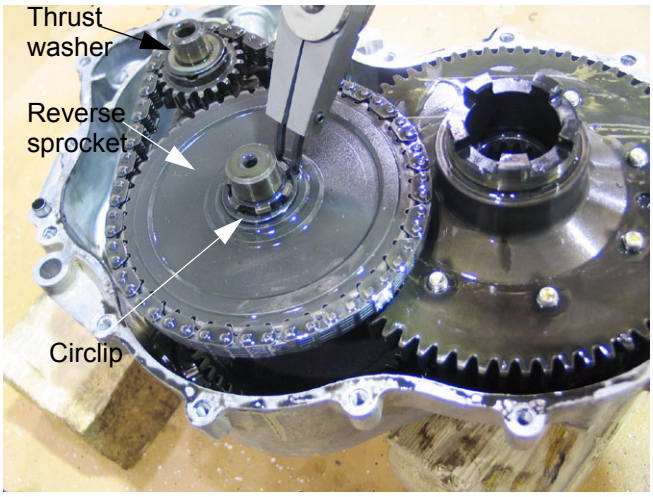

Figure 9.33

9.34. Remove the thrust washer (17.3mm I.D.X 30mm O.D.X 1.4mm thick) from the input shaft.

9.35. Lift the 51-tooth sprocket off of the reduction shaft along with the 19-tooth sprocket from the input shaft and the link-belt reverse chain. See Figure 9.35.

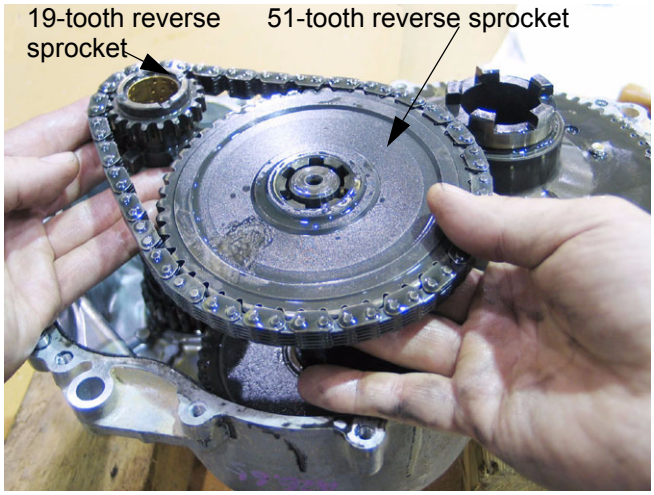

Figure 9.35

9.36. Remove the washers that are behind the sprockets on the input shaft and reduction shaft. See Figure 9.36.

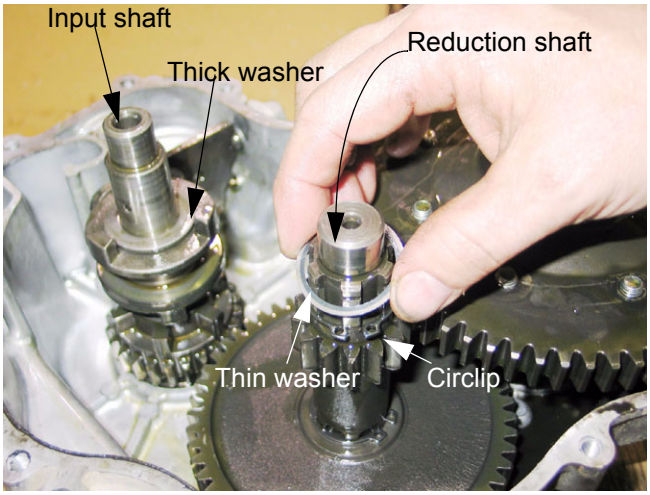

Figure 9.36

- A very thin washer (28.3mm I.D.X 34mm O.D.X 0.3mm thick) rides between the 51 tooth sprocket and the circlip on the reduction shaft.
- A thick washer (22.3mm I.D.X 35mm O.D. X 2mm thick) rides between the dogs on the 19-tooth sprocket and the shift collar.

9.37. The shift collar is trapped onto the input shaft by the shift lever. To remove the shift lever, it is easiest to remove the detent assembly and safety switch. See Figure 9.37.

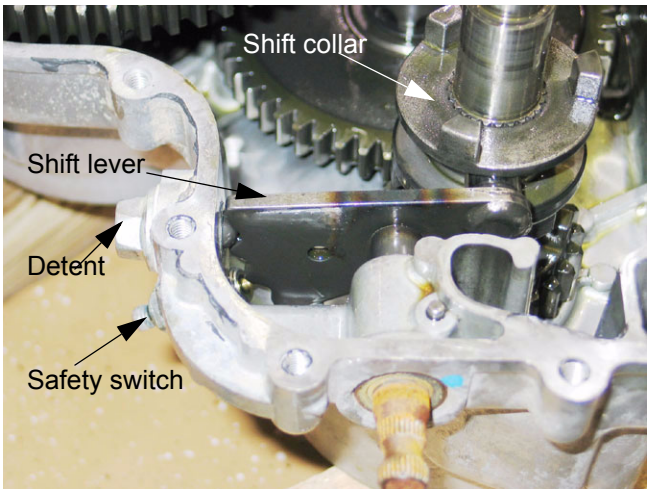

Figure 9.37

9.38. Remove the detent bolt using a 14 mm wrench. See Figure 9.38.

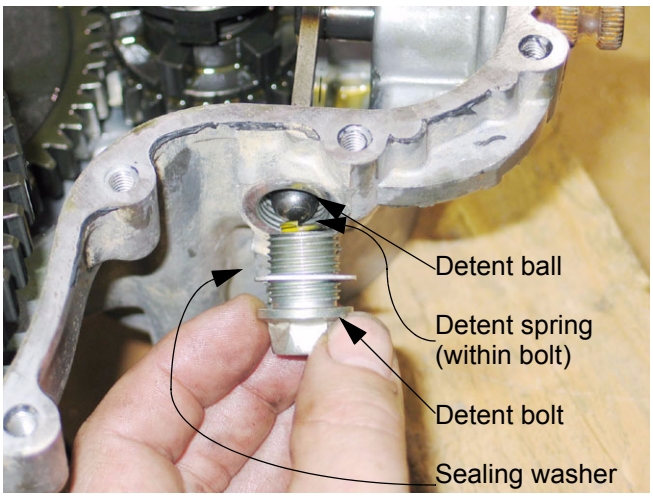

Figure 9.38

NOTE: The detent ball and spring will come out when the bolt is removed. Discard the sealing washer and replace it with a fresh one on reassembly if it shows any signs of leakage.

9.39. Remove the safety switch using a 14 mm wrench. Discard the sealing washer and replace it with a fresh one on reassembly if it shows any signs of leakage.

Poly Bed 4 X 2 Drive System

9.40. Use a magnet to remove the pin that retains the shift lever. See Figure 9.40.

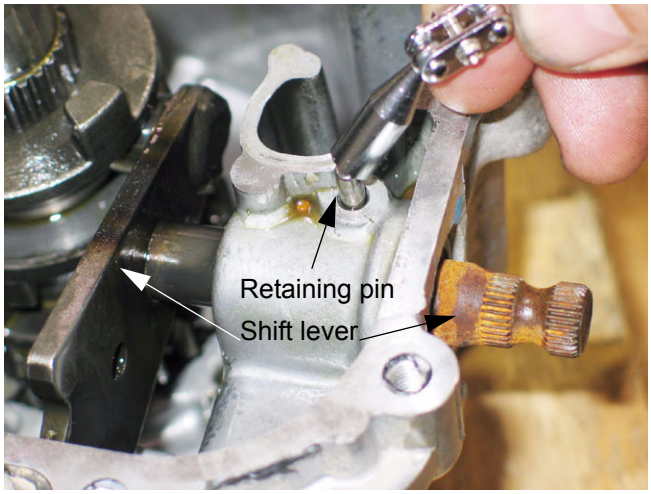

Figure 9.40

9.41. After the pin is removed, slide the shift arm into its bore to retract the pin from the groove in the shift collar.

9.42. When the pin is clear of the groove, lift the shift collar off of the input shaft. See Figure 9.42.

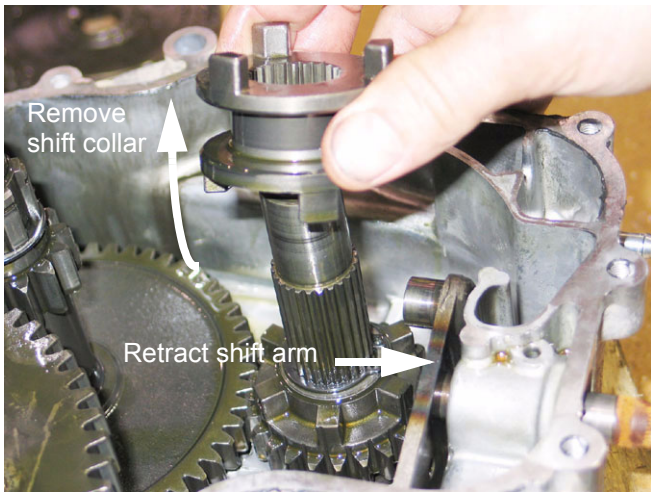

Figure 9.42

NOTE: Wear limits for shift mechanism:

- Width of groove in shift collar: 14.30mm (.563") maximum.
- Roller on shift arm pin: 13.8mm (.54") minimum O.D. 8.2mm (.32") maximum I.D.
- Pin on shift arm: 7.8mm (.31") minimum O.D.

9.43. The differential can be easily lifted out of the transaxle as an assembly, at this point. See Figure 9.43.

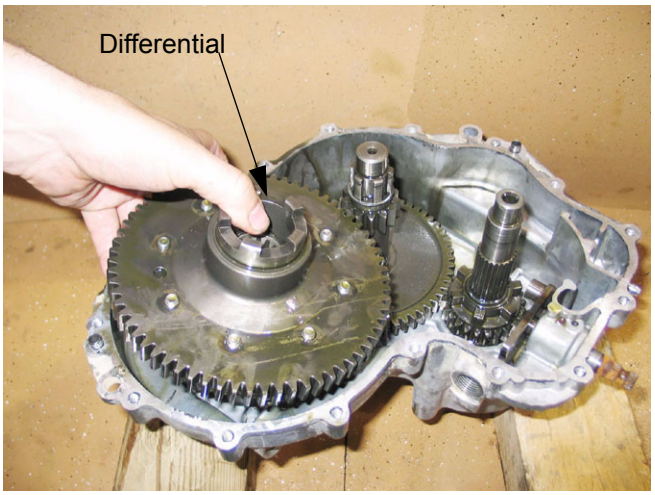

Figure 9.43

9.44. With the differential removed, the reduction shaft and 55-tooth gear can be lifted out of the transaxle together. See Figure 9.44.

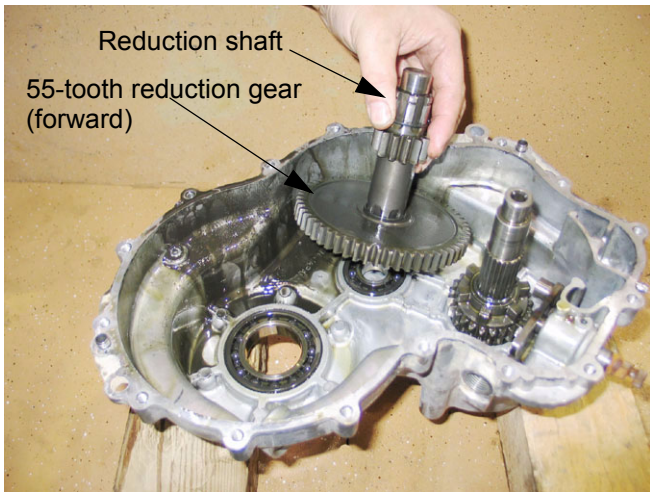

Figure 9.44

9.45. The input shaft can be removed from the case in a similar manner. It may be necessary to drive it out with a soft hammer.

9.46. Like the input shaft, it will be necessary to clean any rust from the exterior part of the shift lever before it is removed. See Figure 9.46.

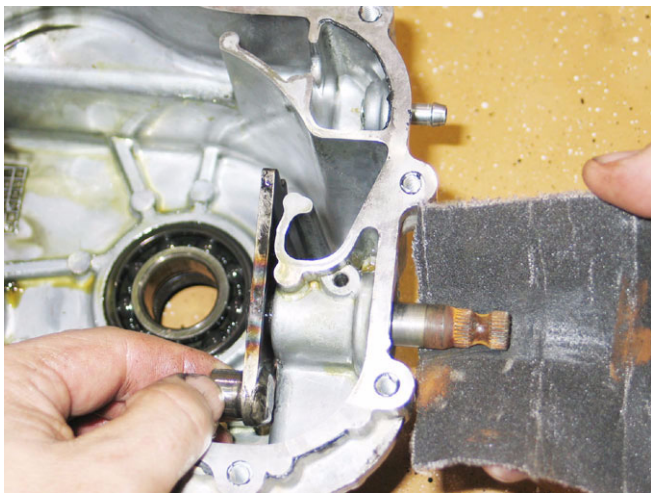

Figure 9.46

9.47. The shift lever can be removed through the inside of the housing. there is a roller on the pin that engages the shift collar. See Figure 9.47.

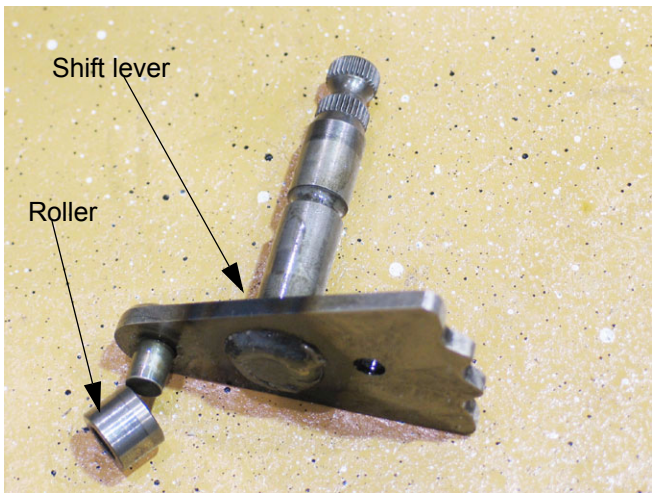

Figure 9.47

9.48. Clean the left side transaxle housing and inspect the bearings.

- The reduction shaft bearing is in a blind hole, and will require a blind bearing removal tool to withdraw from the housing.
- The differential bearing and the input shaft bearing can be driven out.
- As with the right side housing, the even heat of a 200 deg. f.(93 deg c.) oven will loosen the bearings and ease removal. Do NOT us a torch.

9.49. Remove and discard the input shaft seal and the shift lever seal. Replace them with new seals. See Figure 9.49.

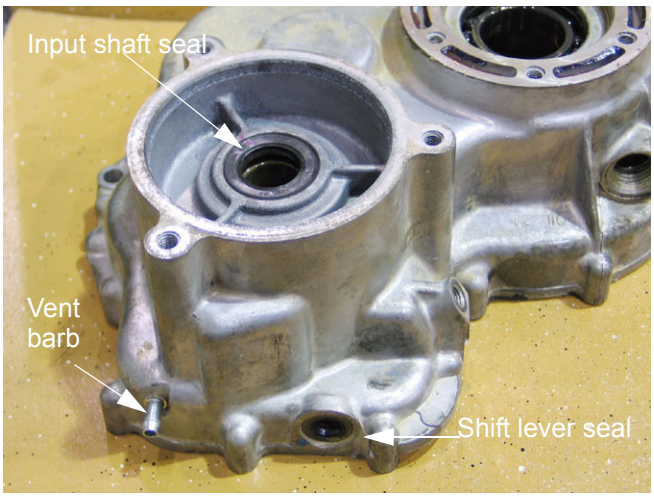

Figure 9.49

9.50. Clean and inspect the reduction shaft and 55-tooth gear. 28mm circlips are used as positive stops to position the gears on the shaft. If they are suspect, replace them. Otherwise they are best left undisturbed. See Figure 9.50.

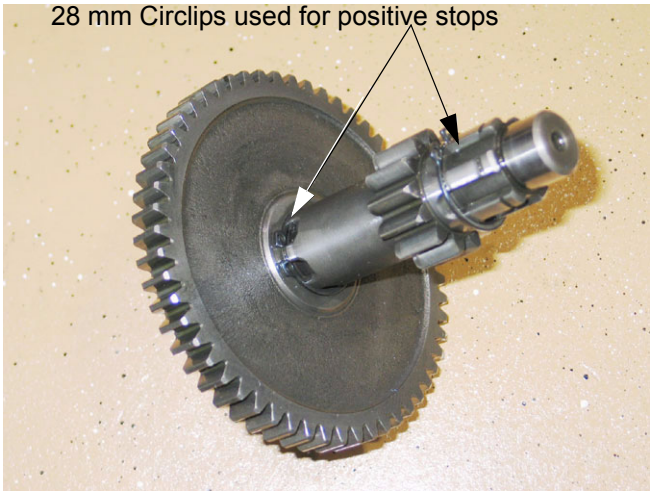

Figure 9.50

Poly Bed 4 X 2 Drive System

9.51. A 28mm circlip holds the 55-tooth forward gear to the reduction shaft. If either component shows wear or damage, remove this clip to separate them. See Figure 9.51.

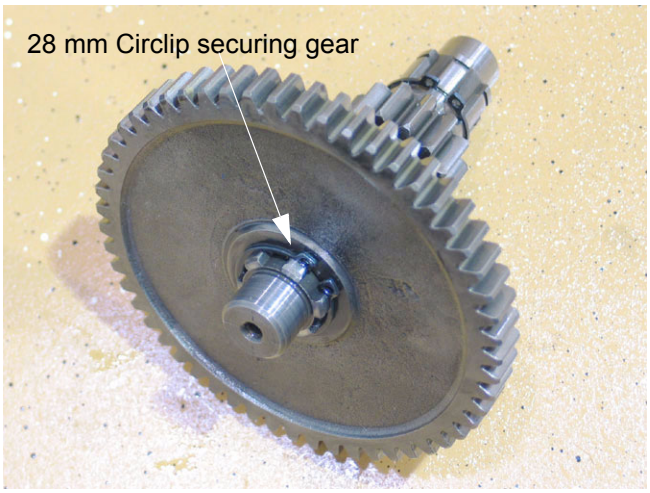

Figure 9.51

NOTE: The gear is reversible, but should be maintained in its original orientation once the transaxle is broken-in.

9.52. Clean and inspect the input shaft.

9.53. The 24-tooth forward gear, along with a washer (25.3mm I.D.X 33mm O.D.X 1mm width) is held on by a 25mm circlip. See Figure 9.53.

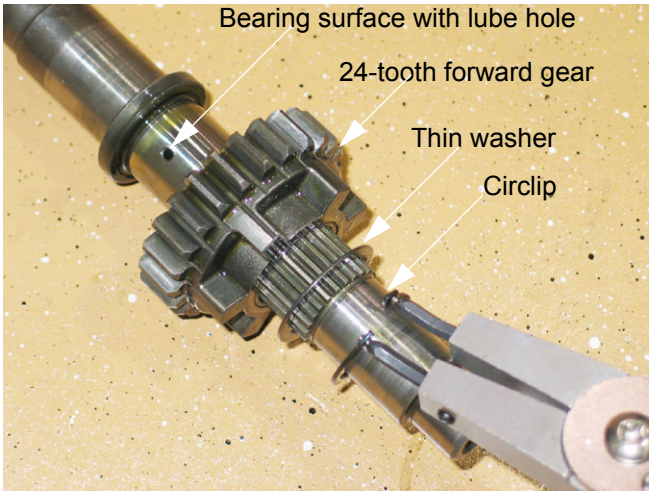

Figure 9.53

9.54. Inspect the bearing surfaces on the input shaft and 24-tooth forward gear. See Figure 9.54.

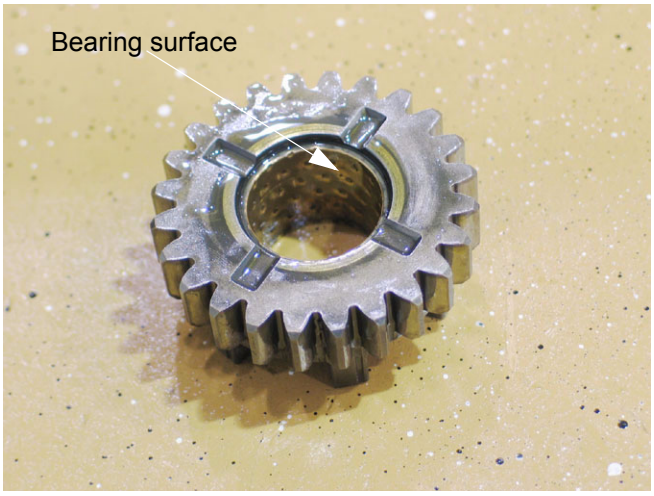

Figure 9.54

NOTE: The bearing surface of the 24-tooth forward gear is very similar to the bearing surface in the 19-tooth reverse sprocket.

9.55. If the gear, shaft, or circlip show signs of wear or damage, replace them. When reassembled, there should be roughly .020” (.50mm) axial clearance (end play) available at the gear. See Figure 9.55.

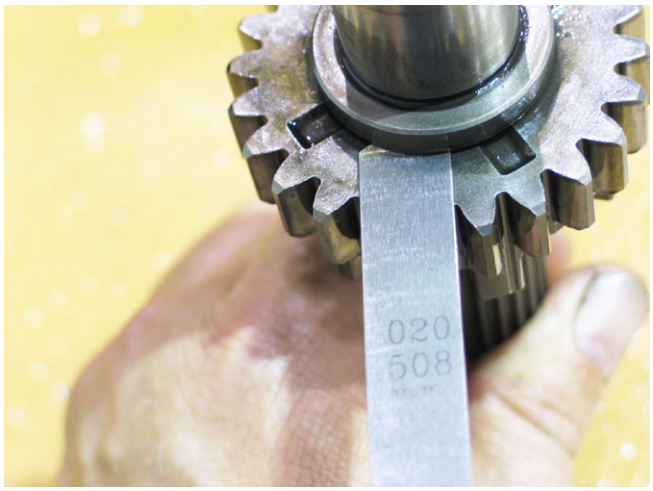

Figure 9.55

9.56. Clean and inspect the differential assembly. See Figure 9.56.

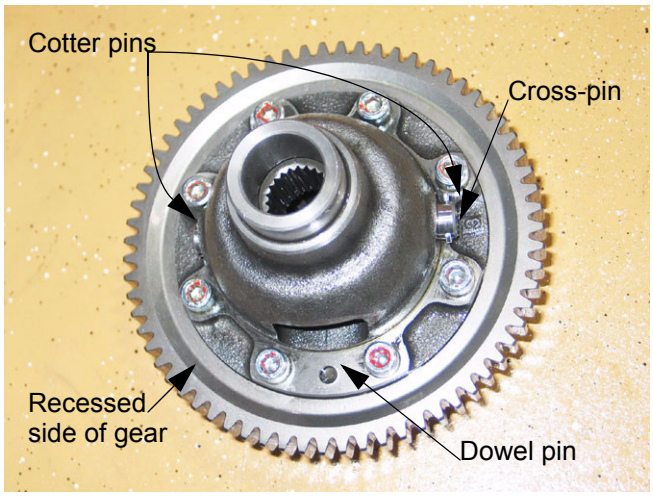

Figure 9.56

- The ring gear teeth should not show wear or damage.
- Differential action should be smooth.
- Cross-pin may be removed for bearing surface inspection by removing the cotter pins that secure it.
- The differential housing can be removed from the ring gear using an 8mm allen wrench.

9.57. If the ring gear is separated from the differential housing, alignment is maintained by a single solid dowel pin. See Figure 9.57.

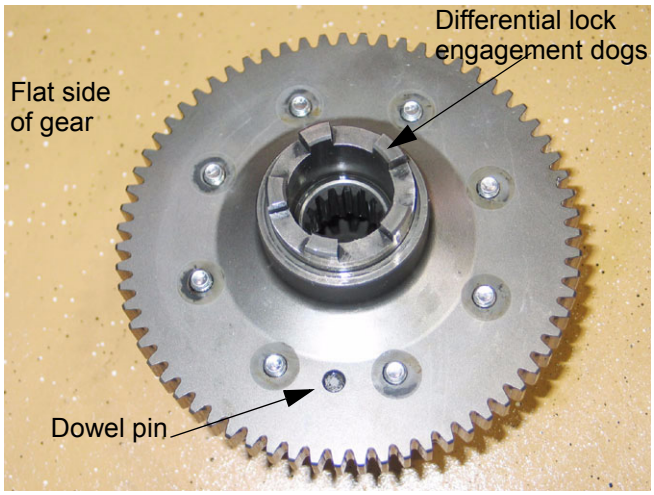

Figure 9.57

- Differential lock dogs should not have worn or damaged teeth.

9.58. With the differential housing separated from the ring gear, and the cross-pin removed the miter gears can be removed from the differential.

9.59. With the cross-pin and miter gears removed, the bevel gear and the thrust washer can be removed for inspection or service.

Assembly notes:

9.60. Hardware:

- Replace all o-rings and seals with new ones.
- Replace any removed cotter pins with new ones.
- Replace any removed circlips with new ones.
- Refer to the torque table for fastener assembly tightness.

9.61. Order of assembly: reverse of disassembly.

- Drive or press bearings by applying force to the race nearest the greatest resistance.
- Apply a small amount of grease or gear-lube to any friction bearing surfaces on assembly.
- Confirm proper fit, orientation, and function during the assembly process.
- Ensure that the Transaxle is filled with 2.0L (within marked range on dipstick when inserted but not tightened) of API “GL-5” hypoid gear oil {SAE 90 above 41 deg. f.(5 deg. c.)} or {SAE 80 below 41 deg. f. (5 deg. c.)} prior to operation.

9.62. Sealing:

- Clean all mating surfaces thoroughly before assembly.
- Mating surfaces should be free of burrs or gouges.
- Apply a thin bead of sealant such as Loctite 515 (Flange Sealant) or Kawasaki Bond (Liquid Gasket-silver): 92104-002
- Do not apply sealant to the O.D. of seals.
- Protect the lips of seals during installation.
- Drive or press seals using a tool that will not damage the seal.
- Apply a small amount of grease or gear lube to o-rings and seal lips.

Table 2: Transaxle Torque

Item	Torque	Note
Ring gear to differential housing	22 ft-lb 29 N-m	1
Differential lock shift-arm stop bolt	87 in-lb 9.8 N-m	
Differential lock shift-arm mounting nut	78 in-lb 8.8 N-m	2 3
Transaxle housing bolts	78 in-lb 8.8 N-m	
Axle tube to transaxle housing	18 ft-lb 25 N-m	
Detent bolt	27 ft-lb 37 N-m	
Safety switch	87 in-lb 9.8 N-m	
diff. lock cable bracket	78 in-lb 8.8 N-m	
shifter cable bracket	18 ft-lb 25 N-m	
Axle nut (castle nut)	110 ft-lb 145 N-m	
lug nuts	25 ft-lb 34 N-m	
Brake backing plate bolts	25 ft-lb 34 N-m	

Note 1: Apply releasable thread-locking compound such as Loctite 242.

Note 2: The cable attachment arm should be 90 degrees rearward from the shift arm within the transaxle.

Note 3: Confirm proper return action from he torsion spring.

Poly Bed 4 X 2 Brake System

ABOUT THIS SECTION:

This section covers brake service and adjustments on the “poly bed” Utility Vehicle 4 X 2 Model 414 (37AN414J710).

1. MAINTNANCE AND DESCRIPTION OF THE BRAKE SYSTEM:

1.1. It is important that the brakes on the Big Country vehicle be properly maintained in order for it to operate safely and dependably. The condition and operation of the brake system should be checked on a regular basis:

- A visual inspection of the cables and linkages should be made, and operational test performed every 50 hours of operation.
- A complete inspection of the brake system (including drums and shoes) should be made every 500 hours or 24 months of operation.
- The initial 50 hour inspection and subsequent 500 hour inspections coincide with the transaxle fluid change intervals.
- Any brake service needs (repair or adjustment) should be made before the vehicle is returned to service.

1.2. The brake pedal arm lifts up on the pull bolt that transmits force to the equalizer bracket. The equalizer bracket distributes the brake pedal force between the cores of two cables. See Figure 1.2.

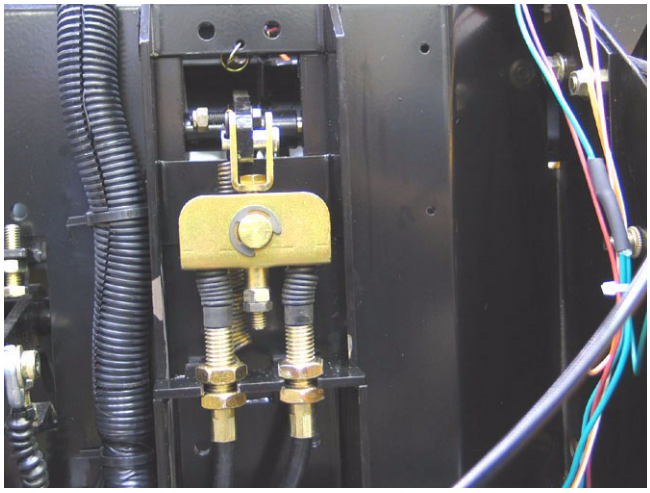

Figure 1.2

NOTE: Some early-production versions of this model may have a stack of bellville washers between the nut on the pull bolt and the equalizer bracket. If present, the washers and bolt should be replaced, as described in service bulletin CC-478

1.3. The two cables extend back to the brakes mounted on the transaxle. See Figure 1.3.

- The cable housings are secured in brackets on the engine / transaxle cradle.
- The cable cores connect to the brake arms on the inboard side of the brake backing plates.

Figure 1.3

1.4. Check the condition of the cables, their mounting hardware and operating mechanisms.

- Jam nuts holding cable to brakce should be secure.
- Locating clamps should be secure.
- Cable cores should not be fryed or corroded. Rubber boots should be intact.
- Cable housings should not be kinked, chafed, burned, crushed, or otherwise damaged.
- Mountings and clevis pins at the back end of teh cable should be in good condition and properly secured.

Poly Bed 4 X 2 Brake System

1.5. Any significant wear, damage, or binding should be addressed prior to making an operational test.

NOTE: the operational test should be performed in a safe location that is free of traffic, obstacles, and hazards.

1.6. If the operator has any specific brake performance complaints, these complaints should direct the visual examination and be confirmed during the operational test. If the opeator describes an inherently unsafe condition, a complete inspection should ber performed in lieu of the operational test.

1.7. **Operational Test** - check the following points of performance:

- The brakes should not drag when they are not applied.

  NOTE: An extremely bad axle bearing can mimic a dragging brake. If the axle shaft does not run concentric to the axle tube that the brake is mounted to, the brake drum will rub on the shoes when the brakes are fully released. This will produce sluggish vehicle response and a grinding noise from the bearing.

- When the brakes are applied at speed, there should be no unusual noises and not pedal pulsation.
- The parking brake should hold the vehicle with a capacity load on a 22 degree incline.
- It should require 110 lbs $\pm$ 10 lbs. (50 Kg. $\pm$ 5 Kg.) pedal force to apply the parking brake.
- Braking force should be fairly evenly distributed between the rear wheels.

1.8. If the Big country utility vehicle does not perform as described, adjust the brakes as described in the brakd adjustment section.

1.9. If adjustment does not completely fix the problem, disassemble the brakes as described in the **Complete Inspection** section of this manual. Replace any worn or damaged parts discovered during inspection.

2. COMPLETE INSPECTION (DRUM AND SHOE REMOVAL) :

2.1. Park the Big Country vehicle on flat level ground.

2.2. To gain access to the front of the brake linkage: See Figure 2.2.

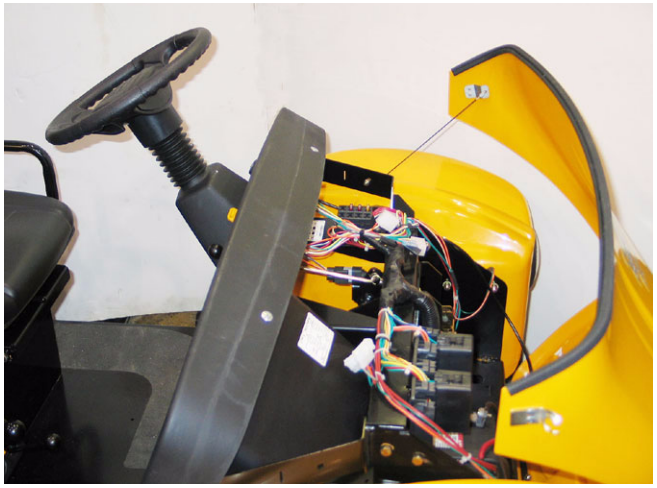

Figure 2.2

- Release the hood straps, and open the hood.
- Disconnect the Z fitting that attaches the hood check cable to the hood.
- Remove the hairpin clip that retains the hood hinge pin in the hood hinge bracket.
- Slide the hood to the left (facing vehicle) and remove it.

2.3. To gain access to the brakes: See Figure 2.3.

Figure 2.3

- Lift and safely support the back of the Big Country vehicle.
- Remove the rear lug nuts using a 19 mm socket, and lift off the rear wheels.
- Release the parking brake, if applied.

2.4. Verify the correct orientation of the brake arm on the brake actuator cam: The clevis pin on the brake lever should be visible just beyond the brake drum when viewed from the side, with the brakes released. See Figure 2.4.

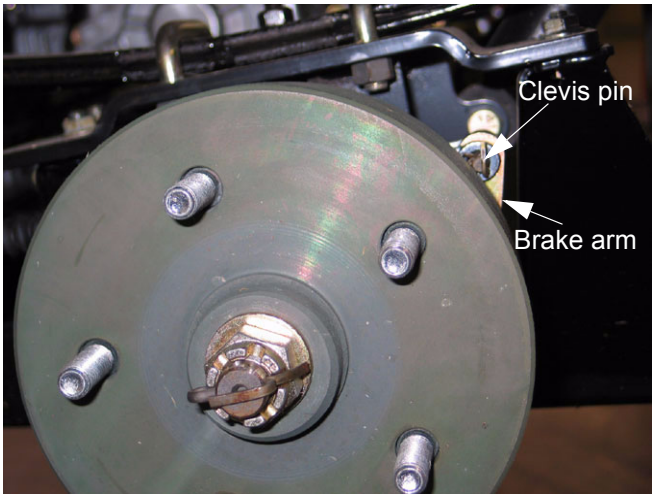

Figure 2.4

2.5. If the brake arms are not in this position, they must be re-oriented: make an index mark with a paint stick or marking pen across the brake lever and the boss that it rests against brake backing plate. This will establish the original position. See Figure 2.5.

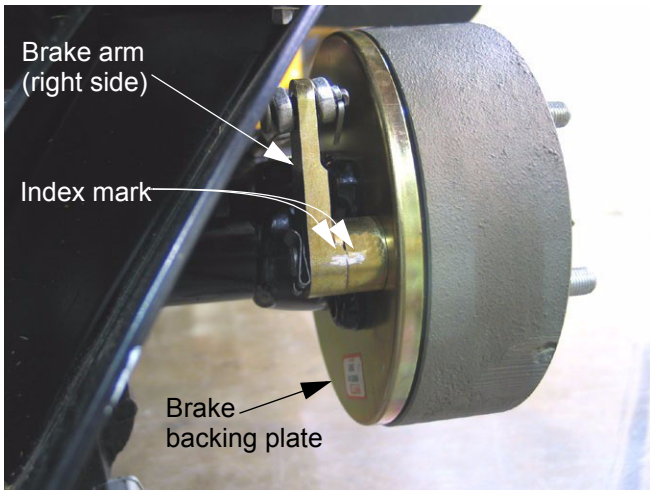

Figure 2.5

2.6. Lift up on the curved lip of the locking clip to release it from the groove in the brake acutator cam.

2.7. Slide the brake arm off of the splined end of the brake actuator cam. See Figure 2.7.

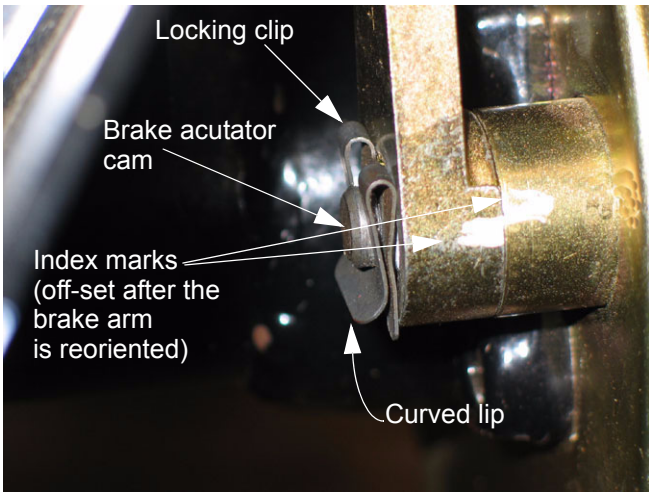

Figure 2.7

2.8. Rotate brake arm as needed, slide it back onto the brake actuator cam, and reinstall the clip.

NOTE: It may be necessary to loosen the top jam nut on the front end of the brake cable housing. This will provide additional slack to allow brake actuator arm movement.

2.9. To remove the brake drums:

2.10. Remove the cotter pins that secure the hub nuts.

2.11. Using a 27 mm wrench, remove the hub nuts and washers. See Figure 2.11.

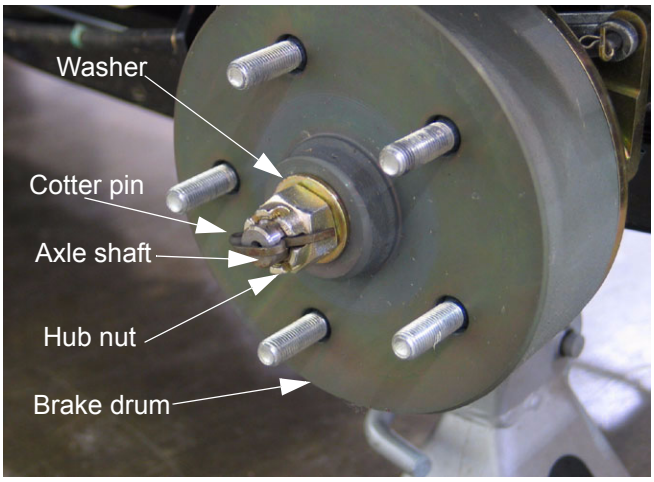

Figure 2.11

Poly Bed 4 X 2 Brake System

2.12. To remove the brake shoes: pivot the shoes away from the backing plate. This will reduce the spring tension.

2.13. Using either a screwdriver or a brake adjusting spoon, step the shoes over the end of the cam. See Figure 2.13.

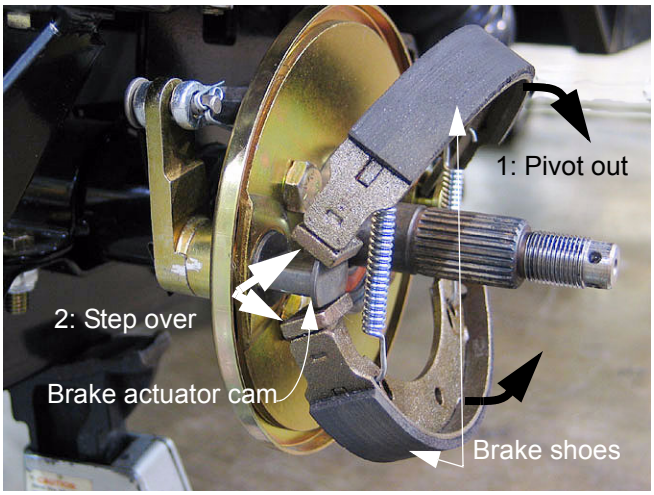

Figure 2.13

2.14. Inspect the bearings, seals, splines, threads, and cam. See Figure 2.14.

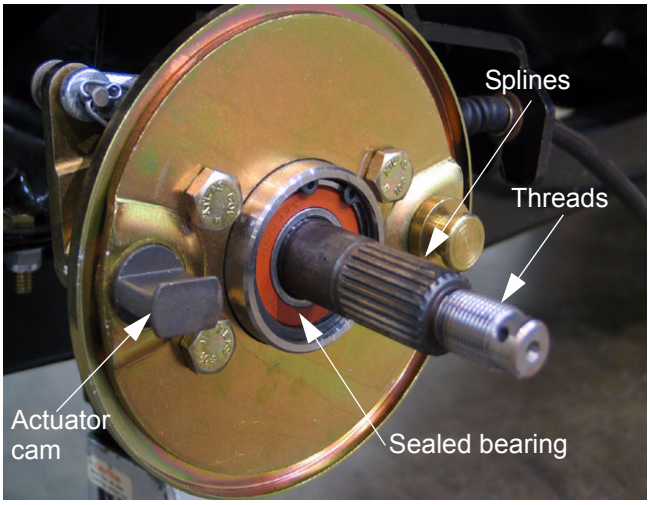

Figure 2.14

2.15. Reassemble the two springs to the new brake shoes. See Figure 2.15.

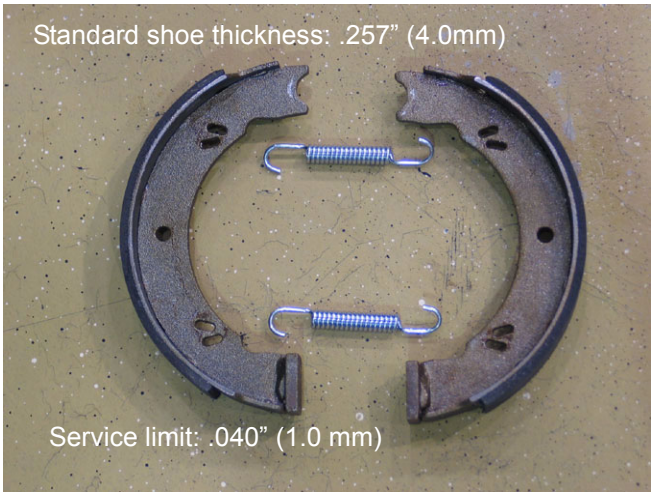

Figure 2.15

NOTE: All four shoes are the same. They are not specific to either axle nor to the top or bottom psoiton on the axles.

NOTE: The springs connect to the outer-most holes on the shoes.

NOTE: The springs hook outward from the inside of the top shoe, and inward from the outside of the bottom shoe.

2.16. Place the top brake shoe over the round pivot point and the flat cam. Allow the top of the brake shoe to tip away from the backing plate.

2.17. Place the lower shoe against the pivot point and by slightly stretching the springs install the lower shoe over the flat cam. See Figure 2.17.

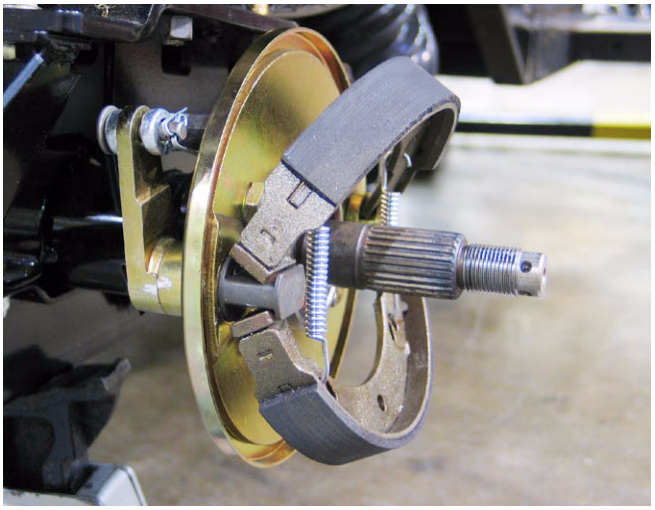

Figure 2.17

2.18. Confirm that the shoes and springs are properly seated. See Figure 2.18.

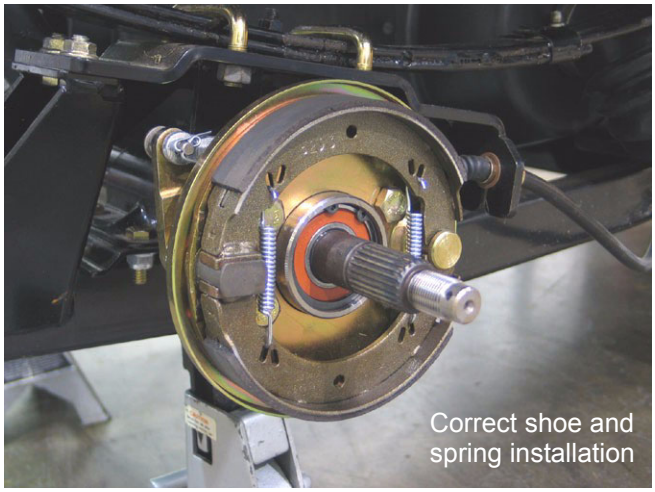

Figure 2.18

2.19. Inspect the brake drums: See Figure 2.19.

Figure 2.19

- The studs should not exhibit any damage.
- The splines should be in good condition.
- The friction surface should be clean.
- The friction surface should not be grooved, scored, bell-mouthed, or tapered.
- The inside diameter of the brake drum should not exceed 6.53” (165.75mm).
- The casting should not exhibit any damage.

2.20. Position the brake drums on the axles, then secure them with the hub nuts and washers. See Figure 2.20.

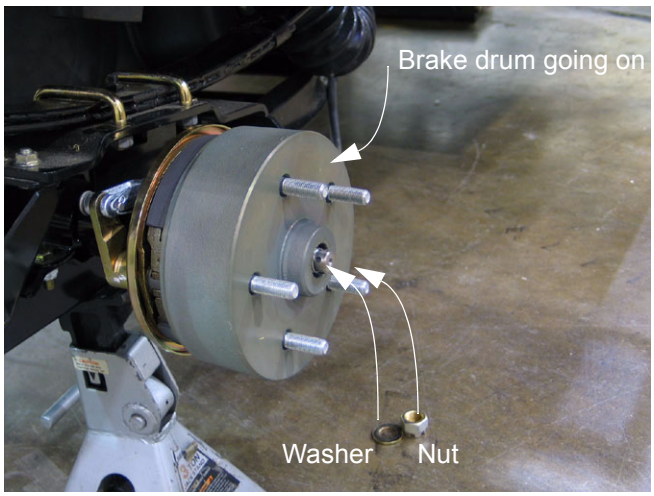

Figure 2.20

2.21. After any brake shoe or drum service, or re-oreinting of the brake actuator arms, the brake linkages should be adjusted.

3. BRAKE ADJUSTMENT (UNDER THE HOOD)

3.1. Adjust the large nuts on the brake cable ends to draw any slack out of the cables, and to maintain the equalizer bracket in a horizontal position using two 7/8” open end wrenches. See Figure 3.1.

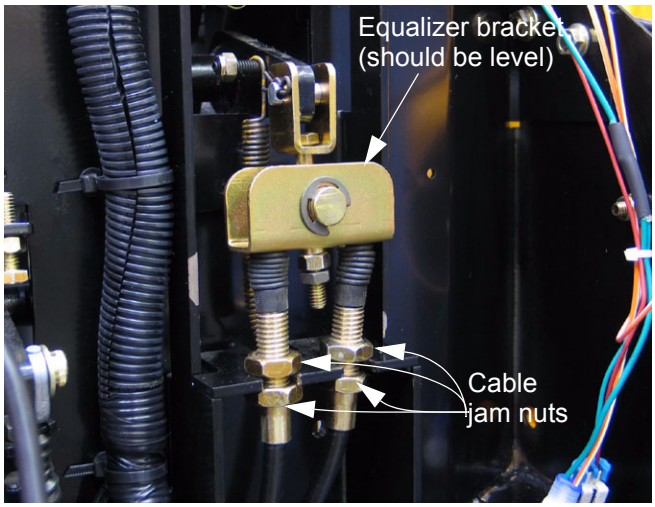

Figure 3.1

Poly Bed 4 X 2 Brake System

3.2. Adjust the nut and jam nut on the bolt that joins the clevis (pinned to the brake pedal arm) to the pivot pin that goes through the equalizer bracket. See Figure 3.2.

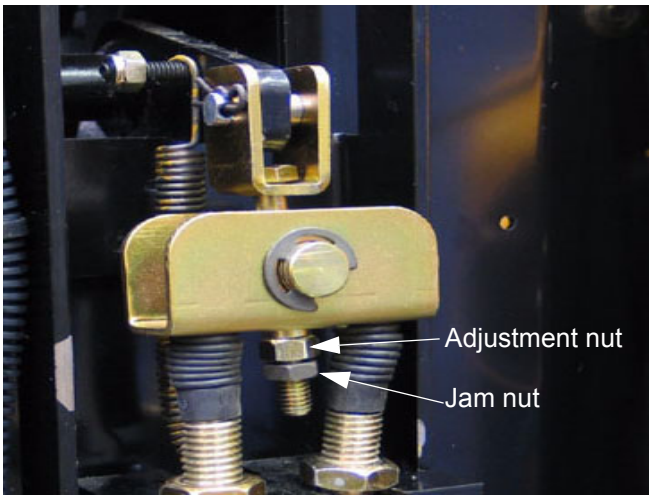

Figure 3.2

3.3. Place a bathroom scale between your foot and the brake pedal. Depress the brake pedal and set the parking brake. It should take approximately 110 pounds ± 10 pounds (50 Kg. ± 5 Kg.) of pressure on the pedal to reach the point where the parking brake will engage. See Figure 3.3.

Figure 3.3

3.4. After making any necessary adjustment using the two large jam nuts on the end of each cable, or the nut and jam nut on the bolt that connects the clevis to the equlizer link pivot pin, check all adjustment hardware to confirm that it is tight.

3.5. Set the parking brake.

3.6. Tighten the hub nuts to 110 ft-lbs. (145 N-m) and secure each with a new cotter pin. See Figure 3.6.

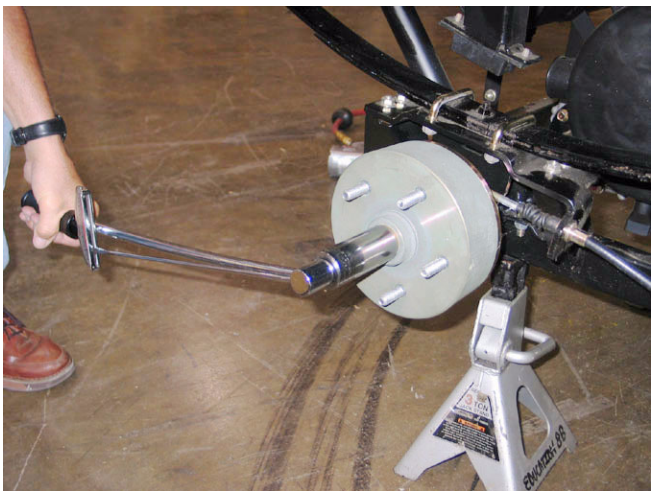

Figure 3.6

3.7. Replace the rear wheels and tighten the lug nuts to 25 foot-pounds (34 N-m).

3.8. After confirming you have the correct brake pressure, start the vehicle while it is on the jack stands and test the brakes by accelerating the engine and applying the brakes.

3.9. With the brakes released, and the engine turned-off, confirm that the rear wheels rotate without drag.

3.10. Lower the rear wheels to the ground, and perform several test stops in a clear, safe area to confirm the correct adjustment and operation of the brake system before returning the Big Country vehicle to service.

- After this initial brake adjustment is performed, any further brake adjustment should be done using the large jam nuts on the forward end of the brake cable.
- If the brake pedal bottoms-out, the adjustment may be tightened, but pedal effort to apply the parking brake should not exceed 120 lbs.
- Confirm correct operation of the brakes after performing any adjustment or service, and check the tightness of all hardware to ensure ooperator safety.

3.11. Confirm that the parking brake light illuminates on the instrument panel when the parking brake is applied, and goes out when the parking brake is released. See Figure 3.11.

Figure 3.11

3.12. If necessary the parking brake switch can be adjusted in its slotted mounting bracket. See Figure 3.12.

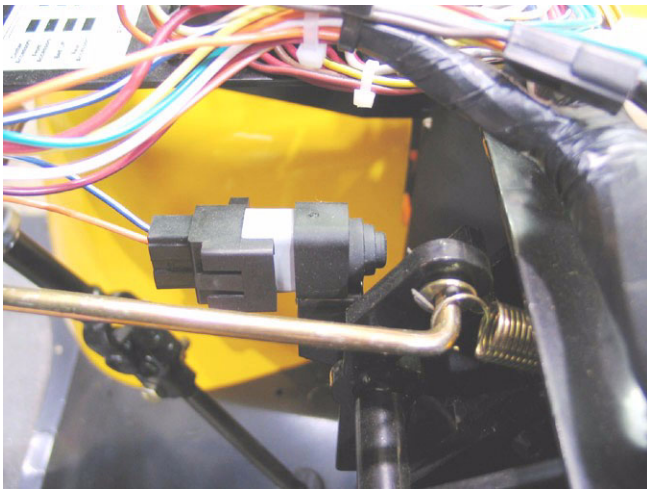

Figure 3.12

3.13. If switch adjustment fails to make the parking brake light work properly, electrical diagnosis is necessary.

3.14. Install and secure the hood.

Poly Bed 4 X 2 Brake System

4 X 2 Drive System - (Steel Bed)

ABOUT THIS SECTION:

This section covers the drive system and transaxle used in the Big Country utility vehicle model series 420 and 430. There was also a low-volume series 410 that used the same transaxle without the differential lock feature. The information in this section does not specifically cover series 410, but is applicable to it. No other manual has been written by Cub Cadet specifically for the non-locking differential version.

1. CUSTOMER RESPONSIBILITIES

- Housing, axle, bearing, or axle tube damage caused by impact or over-loading constitutes customer abuse, and is not covered under the warranty.
- Damaged caused by shock-loading the transmission is not covered under the warranty. Shock-loading is primarily caused by shifting between forward and reverse gears without allowing the vehicle to come to a full stop. This is only possible if the vehicle is operated abusively AND the brake interlock switch is out of adjustment.
- Damage caused by a lubrication failure is not covered under the warranty.
- It is the customer's responsibility to have any leaks repaired in a timely fashion.
- The lug nuts should be inspected for looseness after the first ten hours of operation. Lug nuts should be tightened to a torque of 55-60 ft.-lbs.
- The brakes are not self-adjusting. It is the customer's responsibility to maintain them in good working order and proper adjustment, whether directly or through an authorized Cub Cadet Servicing Dealer.
- It is the customer's responsibility to maintain the vehicle in accordance with the Operator's Manual. This includes an initial gear lube change after 50 hours of operation, and changes every 500 hours of operation (or 2 years) thereafter.
- The gear lube level should be checked every 100 hours of operation. At this time a visual inspection should be made for leaks or damage.

2. GEAR LUBE

2.1. **Service intervals:** Initial change: 50 hours
Subsequent changes: 500 hours of 2 years
Check level: every 100 hours.

2.2. The transaxle should contain between 20 and 24 fluid ounces of 80-90 gear lube or SAE 30 engine oil. 80-90 weight gear lube should be installed at the factory. Cub Cadet Hydraulic drive system fluid plus is an acceptable premium alternative.

2.3. To **check the gear lube** level, park the vehicle on a flat level surface.

2.4. Clean the area around the rubber fill plug on top of the transaxle housing.

2.5. Remove the plug.

2.6. Insert and withdraw a clean steel rule or improvised dipstick. See Figure 2.6.

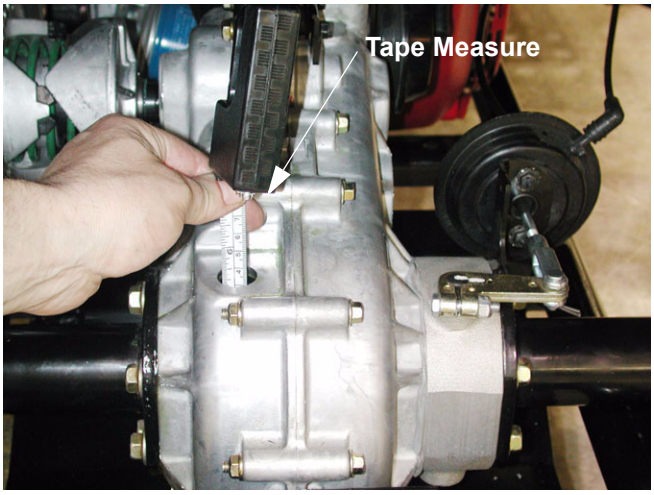

Figure 2.6

2.7. The oil level should be 4 1/2" to 5" down from the top surface of the housing adjacent to the hole.

2.8. If additional lube is needed, confirm the current contents of the transaxle, and add more of the same to reach the specified level.

2.9. If additional fluid is needed, inspect the transaxle for leaks or damage. If leakage is found, make any necessary repairs before returning the vehicle to service.

2.10. A blocked vent can provoke oil leaks. The vent is located at the top of the transaxle housing. See Figure 2.10.

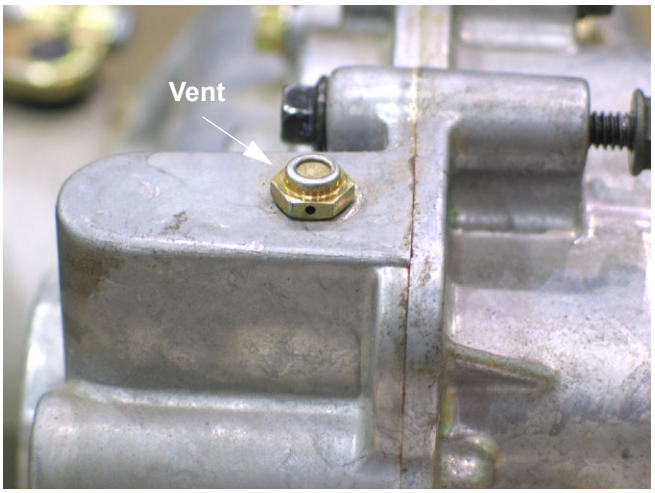

Figure 2.10

2.11. To **change the gear lube**: Clean the area around the fill and drain plugs before removing either.

2.12. Place a drain pan under the transaxle.

2.13. Remove the drain plug at the lower left corner of the transaxle using a 1/2” wrench. Inspect the rubber O-ring on the plug, and replace it if it shows wear.

2.14. Remove the rubber fill plug on top of the transaxle housing. This will allow air to enter the transaxle faster, which will allow the gear lube to drain faster.

NOTE: 80-90 weight gear lube is very thick at low temperatures, and may take considerable time to drain if the ambient temperature is below 40 degrees farenheit. At low temperatures, operating (driving) the vehicle immediately prior to draining the oil will warm the oil, making it easier to drain.

2.15. Install the drain plug and tighten it to a torque of.

2.16. Add 20 to 24 fluid ounces of gear lube.

3. DIAGNOSIS: CONFIRMING TRANSAXLE FAULT

3.1. Get as much information as possible from the customer regarding symptoms and circumstances.

3.1. Inspect the vehicle for physical damage and clues regarding the nature and cause of failure.

3.2. Carefully operate the vehicle if possible, to confirm noises and symptoms.

3.3. Eliminate the possibility of problems with the electronic controls and vacuum actuated shift mechanism before assuming there is an internal problem with the transaxle. Isolate the transaxle. This may be done by operating the transaxle manually for test purposes. See Figure 3.3.

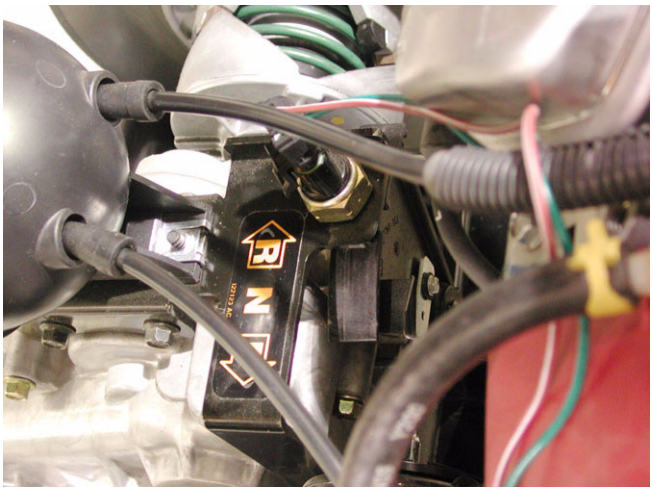

Figure 3.3

3.4. Confirm that the problem is not in the brake system or the belt drive system.

NOTE: Brake system service and adjustment procedures can be found in the 2004 Cub Cadet Technical Service Disc (Form #769-00961).

3.5. If a drive gear (forward or reverse) or the differential lock fail to engage or disengage by manually overriding the shift mechanism, the problem is likely to fall within the transaxle. Performance problems such as failure to reach full speed are likely to caused by engine, brake, or belt/clutch issues.

3.6. An extremely bad axle bearing can mimic a dragging brake. If the axle shaft does not run concentric to the axle tube that the brake is mounted to, the brake drum will rub on the shoes when the brakes are fully released. This will produce sluggish vehicle response and a grinding noise from the bearing.

3.7. If the problem lies within the external shift mechanism or the controls, diagnostic procedures can be found in the 2004 Cub Cadet Technical Service Disc.(Form # 769-00961).

3.8. If the gears can be shifted manually (or using the the gear selector buttons) with the engine off, but are difficult to shift with the engine running, there may be excessive belt drag on the input pulley. Loading the input shaft can bind the gears, creating too much friction for the shift mechanism to over-come.

4. DIAGNOSIS AND SERVICE: DRIVE BELT AND CLUTCHES (CVT OR CONTINUOUSLY VARIABLE TRANSMISSION)

4.1. Park the vehicle on a firm level surface, with the ignition turned off, and lift the load bed to provide access to the drive system.

4.2. Inspect the belt and clutches (pulleys) for obvious damage and wear. The belt should measure at least 1.10 (27mm) across the outside (wide) surface. If it measures less than this it is worn, and should be replaced. Confirm that the correct belt is on the vehicle: Cub Cadet Part # 754-04018A. The outside of the belt should be flat, not ribbed.

4.3. With the transaxle in neutral, it should be possible to rotate the driven pulley (on the transaxle) without applying a force of more than 20 inch-lbs. to the driving pulley (on the engine). The belt should slip easily on the driving pulley.
See Figure 4.3.

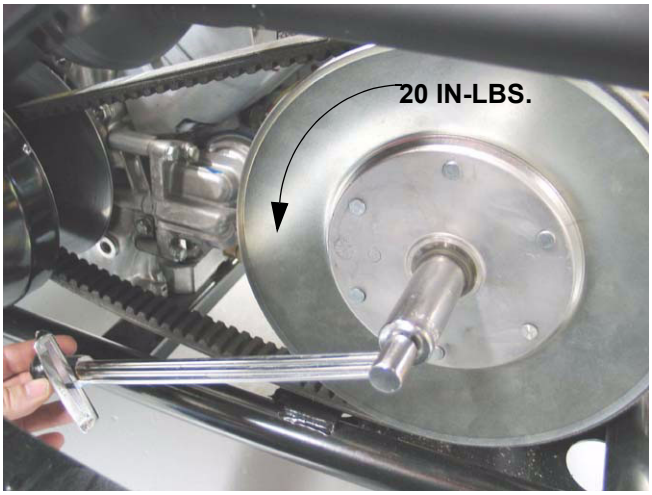

Figure 4.3

- A torque wrench with a 3/4” socket on it should read less than 20 in.-lbs. while rotating the input shaft.
- If this figure is exceeded, remove the belt and repeat the test. This will confirm if the bind is internal or external.
- If the problem is internal, examine the transaxle, if the problem is external, examine the CVT.

4.4. With the vehicle in neutral, insure that no unsafe conditions will arise from starting the engine.

4.5. Connect at tachometer to the engine.

4 X 2 Drive System - (Steel Bed)

4.6. Start the engine and check idle speed. The engine should idle at 1,400 RPM ± 150. Correct the idle speed if it is not in this range. If it is higher, the clutch will drag.

4.7. The idle speed is controlled by the amount of tension on the small spring on the governor linkage. See Figure 4.7.

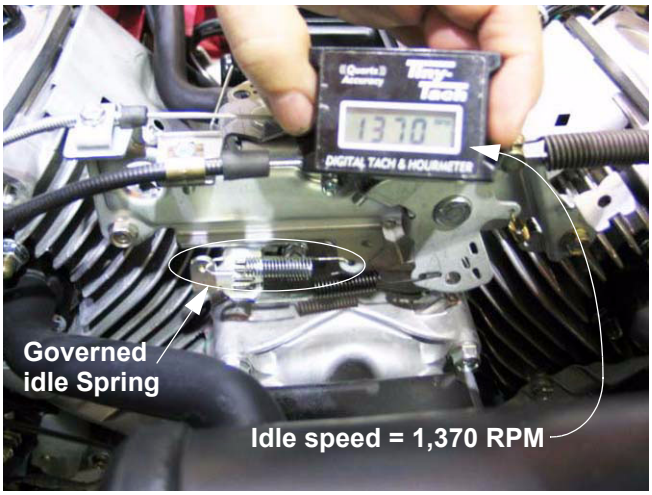

Figure 4.7

4.8. The throttle stop on the carburetor should be set so that no-load engine speed never falls below 1,000 RPM. See Figure 4.8.

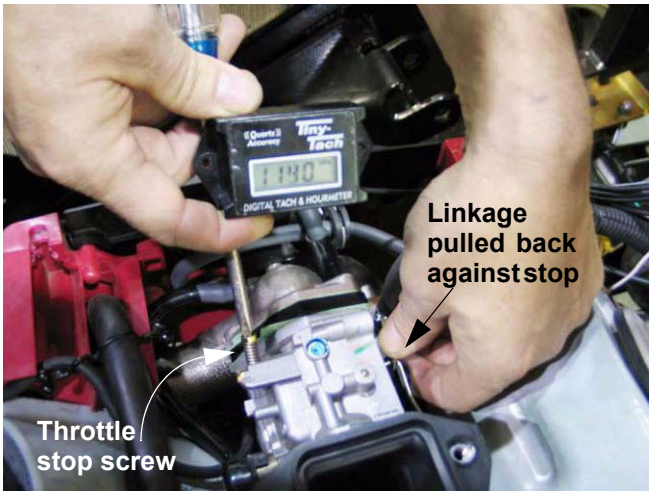

Figure 4.8

NOTE: It is necessary to remove the air filter assembly to reach the throttle stop screw.

- If the throttle stop is set too high it will over-ride the governed idle. This may cause belt drag, which will interfere with gear selection.
- If the throttle stop is set too low, the engine may stall when load is suddenly removed at the same time the throttle is returned to idle.

4.9. If the vehicle fails to reach full speed (20 MPH) or has lost performance, and the belt is good, confirm that the engine still achieves it's specified top-no-load speed and that the CVT responds accordingly.

4.10. Top-no-load engine speed should be 3,850 RPM ± 150. Confirm this with a tachometer. See Figure 4.10.

Figure 4.10

4.11. Watch the travel of the belt as the engine speed increases from idle speed to top-no-load speed.

4.12. Engine top-no-load speed is adjustable using the vertical phillips head screw on the governor linkage. See Figure 4.12.

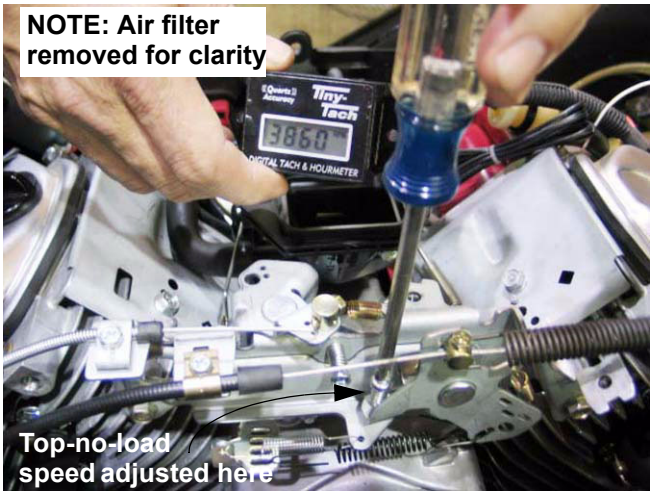

Figure 4.12

4.13. At around 1,400 RPM the sheaves of the driving pulley should begin to close on the belt. See Figure 4.13.

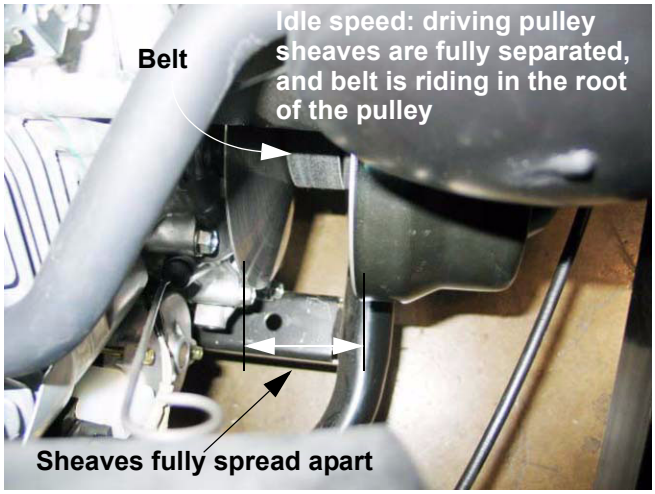

Figure 4.13

4.14. There should be no significant power transmitted through the belt at idle speed. See Figure 4.14.

Figure 4.14

4.15. As the engine speed increases from idle speed to roughly 3,000 RPM, the sheaves of the driving (engine) pulley will close-down on the belt. See Figure 4.15.

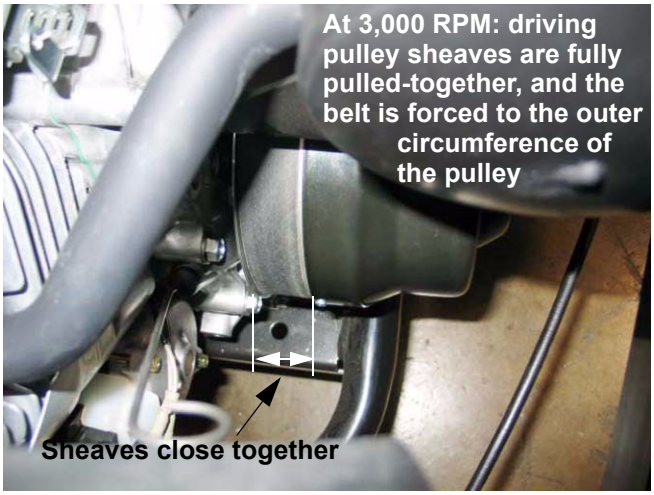

Figure 4.15

- In the first increments of travel (closing sheaves), the driving pulley will begin to transmit force through the belt.
- As the driving pulley increases speed, and the sheaves are drawn closer together by centrifugal force acting on weights, the belt is forced outward. As the belt is forced away from the root of the pulley, to the perimeter, the drive ratio changes.
- At lower pulley speeds, a “power ratio” exists between the driving pulley and the driven pulley. As speed increases, the drive gradually shifts to a “speed ratio”.
- As the driving pulley tightens the belt, it is drawn deeper into the sheaves of the spring-loaded driven pulley. This maintains constant tension on the belt, and enhances the ratio change.

4.16. The ratio change should be fully accomplished by 3,000 RPM. Beyond this speed, increases in vehicle speed are directly proportional to increases in engine speed. See Figure 4.16.

Figure 4.16

NOTE: In Figure 4.16 the belt is drawn fully into the driven pulley by the squeezing action of driving pulley.

4.17. When engine speed is drawn below 3,000 RPM by a heavy load and/or steep grade, the CVT pulleys automatically begin to change ratios to increase available power to the wheels.

4.18. **Alignment:** correct spacing and alignment of the engine and transaxle is set at the factory using special fixtures.

4.19. The transmission is mounted to brackets that allow little room for adjustment.

4.20. The holes for the engine mounting bolts are over-sized to accommodate adjustment.

4.21. If belt drag, accellerated belt wear, or loss of top speed are noticed, particularly after service that requires engine removal, check the alignment and spacing.

4.22. Spacing is correct when belt drag torque is correct, as described in paragraph 4.3.

4.23. Alignment can be done visually, using a straightedge.

5. CVT REMOVAL: DRIVEN PULLEY

5.1. To remove the driven pulley, begin by removing the bolt that holds it to the input shaft of the transaxle using a 3/4” wrench.

NOTE: If an impact wrench is not available, it may be necessary to manually place the transmission in Forward gear and set the parking brake.

5.2. Carefully roll the drive belt off of the driven pulley. See Figure 5.2.

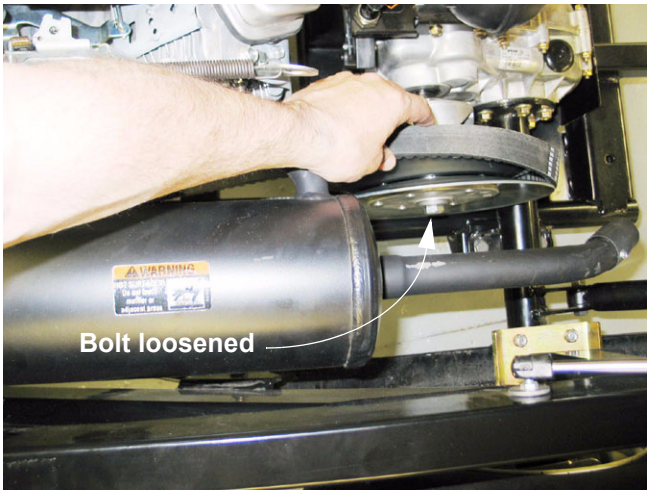

Figure 5.2

5.3. Slide the pulley off of the input shaft. It may be necessary to carefully pry on the pulley hub. See Figure 5.3.

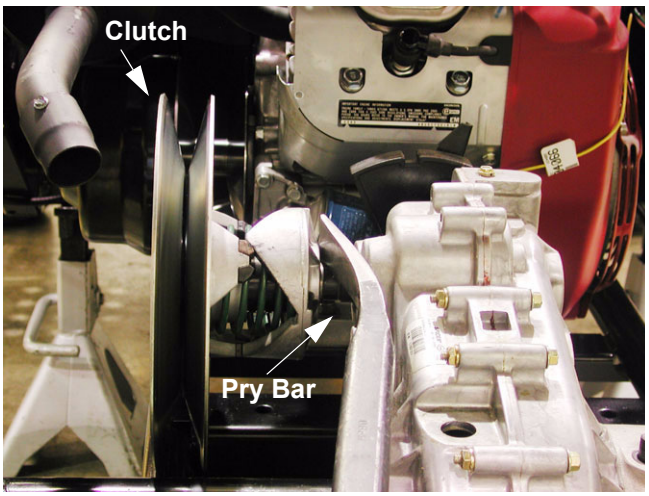

Figure 5.3

5.4. If the driven pulley does not function properly, replace it as a complete unit.

5.5. Key points to inspect on the driven pulley are the ramp surfaces on the cams, and the polymer buttons that ride against the ramps. See Figure 5.5.

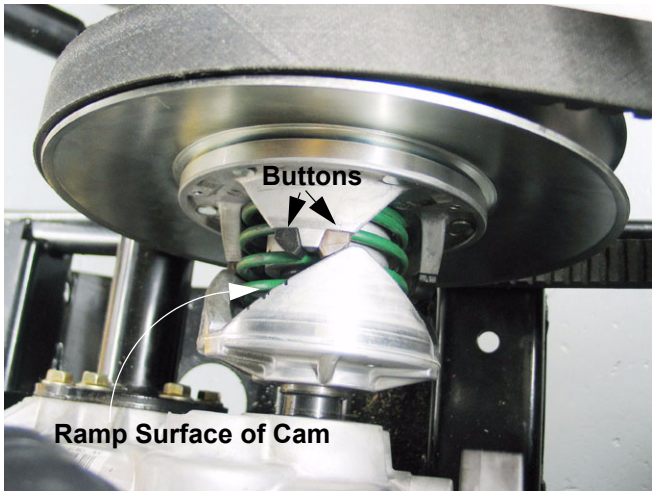

Figure 5.5

- A worn ramp surface on the cam will change the acceleration and power characteristics of the drive system.
- A rough ramp surface on the cam will cause sticking and inconsistent pulley reaction.
- Polymer buttons worn to less than 1/16” may damage the ramp surface.

5.6. Installation notes for the driven CVT pulley CVT:

- Apply a light coating of anti-seize compound to the input shaft before pulley installation. Wipe off any excess.
- Apply a small amount of releasable thread locking compound such as Loctite 242 (blue) to the threads of the bolt.
- Tighten the bolt to a torque of 60 ± 5 ft.-lbs.
- Re-connect the spark plug leads.
- Test-drive the vehicle before returning it to service.

5.7. Beyond the warranty period, if a dealer chooses to service a driven clutch, service information and specialized tools are available from:

Hoffco/Comet Industries
358 NW F Street
Richmond, IN 47374

(765) 966-8161

6. CVT REMOVAL: DRIVING PULLEY

6.1. Disconnect and ground the spark plug H.T. leads.

6.2. Carefully pry the plastic plug out of the center of the clutch cover. See Figure 6.2.

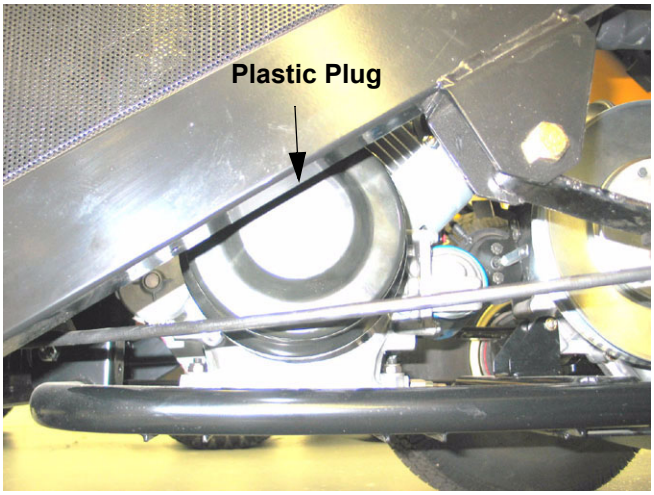

Figure 6.2

6.3. Loosen the bolt securing the driving pulley to the engine crankshaft using a 9/16” wrench. See Figure 6.3.

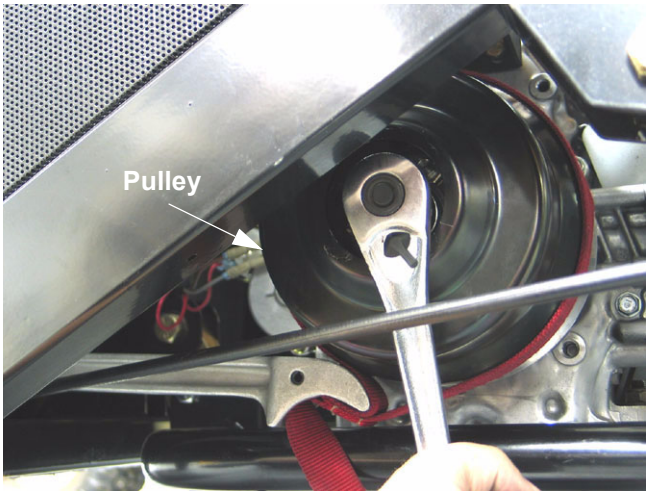

Figure 6.3

NOTE: If working without an impact wrench, it may be necessary to hold the clutch with a strap wrench. If this is the case, position the strap wrench around the largest diameter section of the pulley, where the lip of the cover is attached to the sheave. This is the strongest point. Holding the pulley there is not likely to damage the cover.

4 X 2 Drive System - (Steel Bed)

6.4. Remove the drive belt.

6.5. After the center bolt is loosened, remove the three screws that hold the cover onto the driving pulley.

6.6. Slide the cover off of the driving pulley. There is not enough clearance to remove the driving pulley with the cover in place. See Figure 6.6.

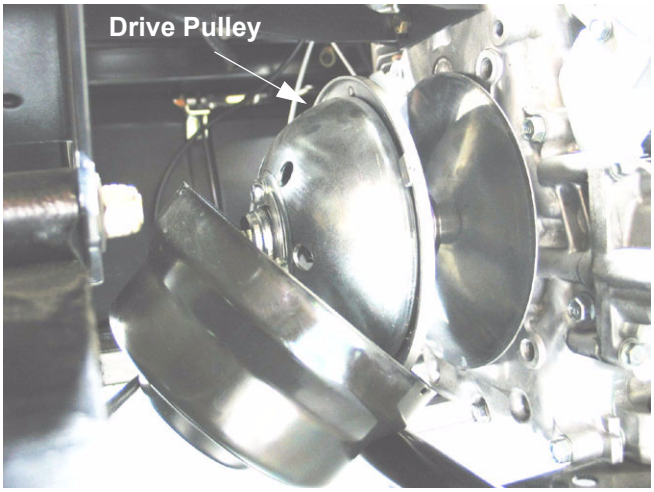

Figure 6.6

6.7. Remove the center bolt and stepped washer that secure the driving pulley to the crankshaft, and slide the pulley off of the crankshaft. See Figure 6.7.

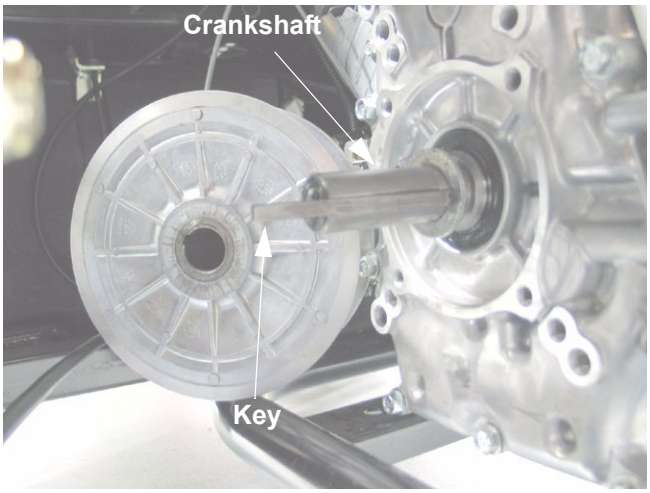

Figure 6.7

6.8. If the driven clutch does not function properly, replace it as a complete unit.

- Apply a light coating of anti-sieze compound to the crankshaft before clutch installation. Wipe off any excess.
- Note that the key extends well beyond the end of the crankshaft. It may be easiest to install the key using the following method: Slide the pulley onto the crankshaft without the key. Position the key in the keyway in the pulley and apply gentle inward pressure, then slowly rotate the pulley until the key slips into the keyway in the crankshaft.
- Apply a small amount of relishable thread locking compound such as Loctite 242 (blue) to the threads of the bolt.
- Install the bolt and stepped washer, and tighten the bolt to a torque of 30 $\pm$ 5 ft.-lbs.

7. TRANSAXLE REMOVAL AND REPLACEMENT

The transaxle is carried on the engine/transaxle cradle, and the entire cradle moves up and down with the travel of the suspension. It pivots on a dog-bone joint to allow for some degree of axial twist in relation to the rest of the chassis, as well as up and down travel. The engine and transaxle cradle maintains correct alignment and spacing between the engine and the transaxle. The transaxle also mounts directly to the leaf springs.

7.1. Park the utility vehicle on firm level ground where there is sufficient room to work around the sides and rear of the vehicle. Set the parking brake.

7.2. If working without an impact wrench: loosen the lug nuts on the rear wheels 1/2 turn each, then lift the bed and loosen the bolt that secures the driven pulley to the input shaft of the transaxle. Both tasks can be accomplished using a 3/4" socket on a breaker bar.

7.3. Release the parking brake, and lower the bed.

7.4. Disconnect the bottom of both rear shock absorbers from the brackets on the transaxle using a 5/8" wrench and 11/16" wrench. See Figure 7.4.

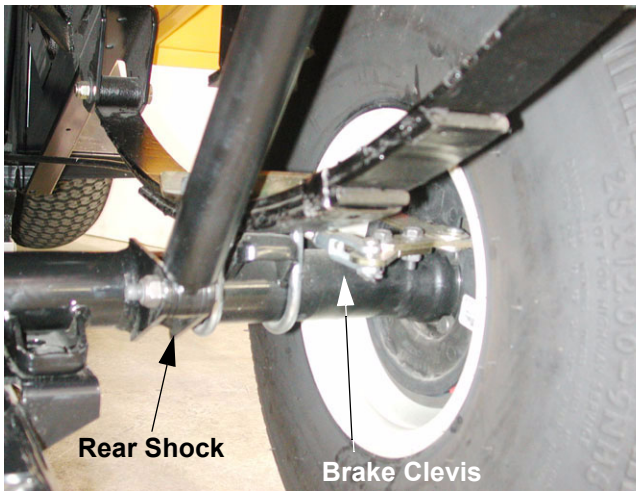

Figure 7.4

7.5. Loosen the clevis jam nuts on the threaded end of each brake cable core 1/2 turn using a 1/2" wrench.

7.6. Remove and discard the cotter pins securing the clevis pins into each brake cable clevis/actuator arm connection. Remove the clevis pins.

7.7. Thread the clevises off of each brake cable.

7.8. Remove the E-clips that secure each brake cable to the brackets on the transaxle using a flat-bladed screwdriver or an E-clip removal tool. See Figure 7.8.

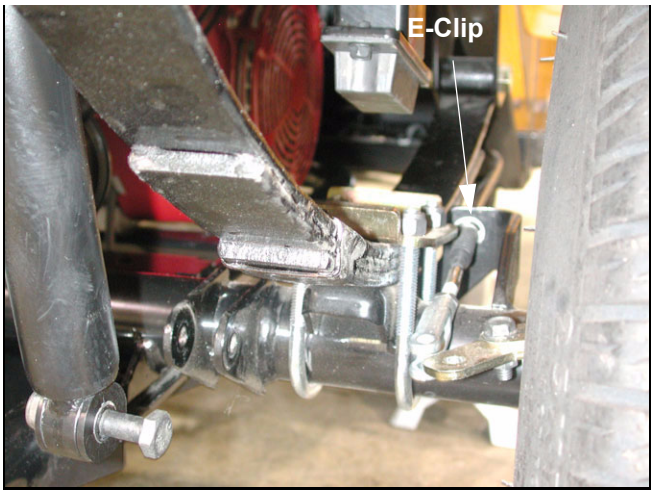

Figure 7.8

7.9. With the E-clips and clevises removed, the brake cables can be withdrawn from the brackets on the transaxle and moved out of the way. there is a flat washer on each cable, just in front of the bracket.

7.10. Place a drain pan under the transaxle and remove the drain plug on the bottom left side of the transaxle housing using a 1/2" wrench. Remove the rubber plug from the top of the housing to allow air to enter, for faster draining. See Figure 7.10.

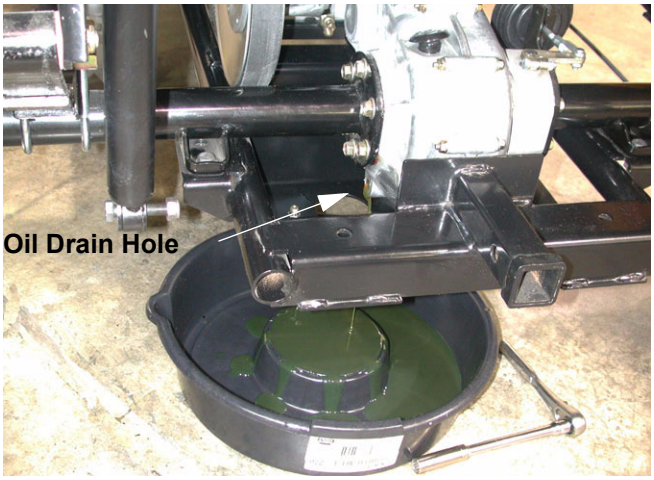

Figure 7.10

7.11. Raise the bed and disconnect the sparkplug wires.

4 X 2 Drive System - (Steel Bed)

7.12. Carefully roll the drive belt off of the driven pulley on the transaxle. See Figure 7.12.

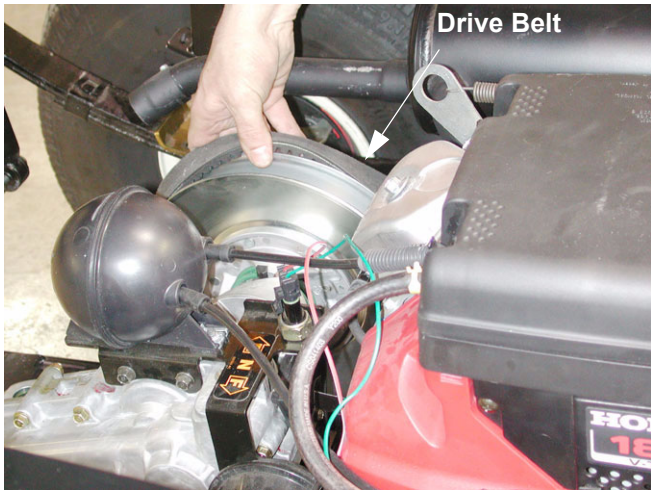

Figure 7.12

7.13. Match-mark the differential lock lever to the splined shaft that it clamps to.

7.14. Loosen the clamp bolt that pinches the differential lock lever tight on the shaft using a pair of 7/16" wrenches. Carefully lift the lever off of the shaft. See Figure 7.14.

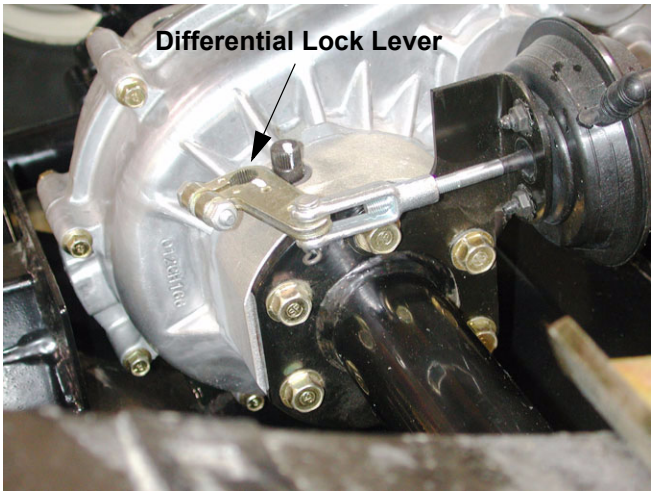

Figure 7.14

NOTE: Alternatively, the cotter pin and clevis pin that secure the actuator shaft to the lever can be removed.

7.15. Remove the three bolts that hold the differential lock actuator(servo) bracket to the transaxle using a 9/16" wrench.

7.16. Lift the differential lock actuator and bracket out of the way. It is not necessary to disconnect the vacuum lines nor the vent lines.

7.17. Unplug the neutral switch wires from the neutral switch, located on top of the forward-neutral-reverse actuator mounting bracket.

7.18. Remove the screw that connects the forward-neutral-reverse actuator to the shift wedge using a 1/4" wrench. disconnect the actuator from the shift wedge. See Figure 7.18.

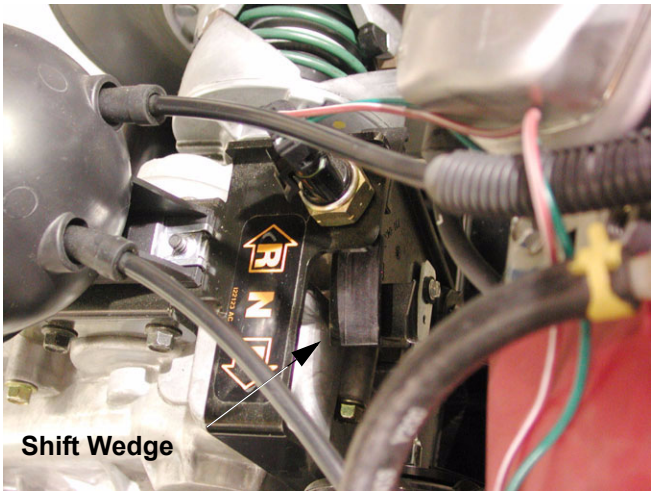

Figure 7.18

7.19. Remove the bolt holding the bracket for the forward-neutral-reverse actuator to the side of the transaxle using a 1/2" wrench.

7.20. Remove the bolts holding the bracket to the top of the transaxle using a 3/8" wrench and a 7/16" wrench. See Figure 7.20.

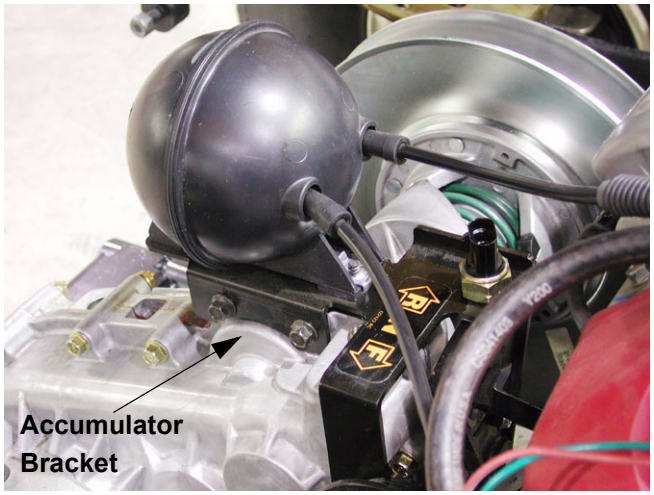

Figure 7.20

7.21. Lift up on the bracket to remove it from the transaxle, complete with the actuator and the vacuum reservoir (the black sphere mounted to the top of the bracket). It is not necessary to disconnect the vacuum lines from the reservoir or the actuator.

7.22. Install the drain and fill plugs, remove the drain pan and lower the bed.

7.23. Lift and safely support the rear of the vehicle. See Figure 7.23.

Figure 7.23

NOTE: Jackstands must be placed under the frame, not the engine/transaxle cradle.

NOTE: The cross member that the bracket for the dog-bone joint is attached to provides a convenient place for jackstands. It is near the center of gravity: the entire vehicle will usually balance on two jackstands at this location. Because of the teeter-totter effect, the rear wheels will be left on until the transaxle is removed.

7.24. Remove the U-bolts holding each spring to each axle tube using a 9/16” wrench. See Figure 7.24.

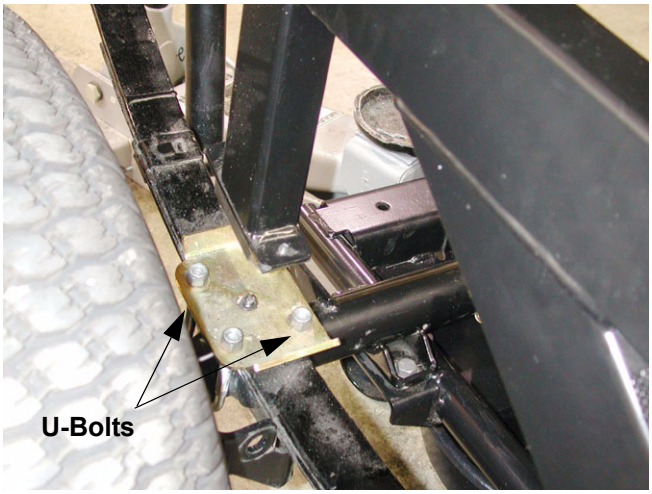

Figure 7.24

7.25. Lower the transaxle, engine, and cradle to the ground, so that they rest on the rear wheels. Leave the jack in position.

7.26. Remove the previously loosened bolt that holds the driven pulley to the input shaft of the transaxle.

7.27. Carefully pry the driven pulley off of the shaft. See Figure 7.27.

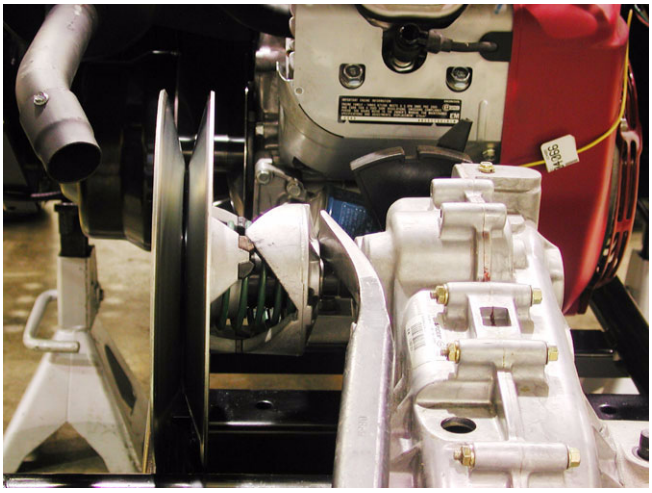

Figure 7.27

7.28. Remove the key from the keyway in the input shaft.

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7.29. Remove the bolt that connects the front of the transaxle housing to the torque bracket on the engine/transaxle cradle using a 3/8” wrench and at 7/16” wrench. See Figure 7.29.

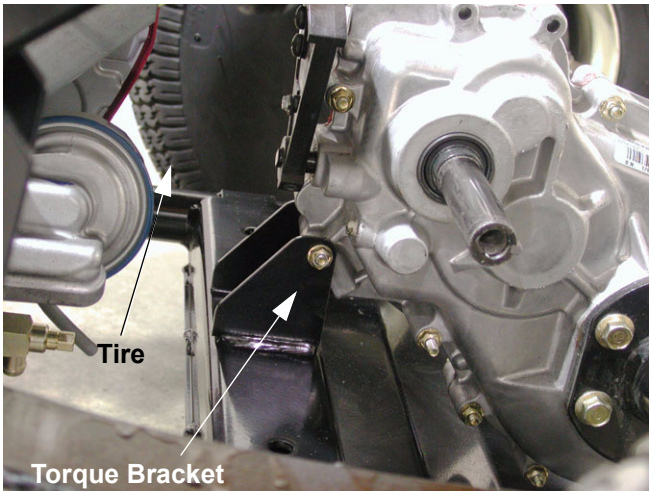

Figure 7.29

7.30. Loosen the mounting bolts that connect the transaxle to the mounting ears on the engine/transaxle cradle.

7.31. Grasp the transaxle by the input shaft to keep it from tipping forward as the bolts are removed. Remove the bolts. See Figure 7.31.

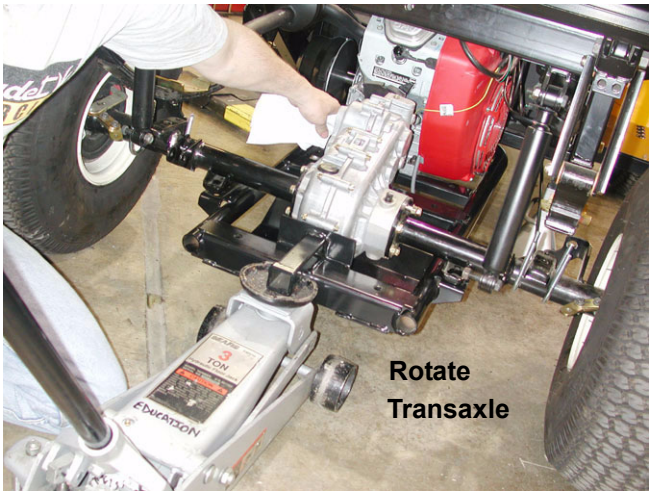

Figure 7.31

NOTE: The input shaft will have anti-seize compound on it.

7.32. Lower the jack completely, tip the front of the transaxle up so that the housing clears the hitch receiver gusset on the cradle, and roll the transaxle clear of the cradle on it’s own two wheels. See Figure 7.32.

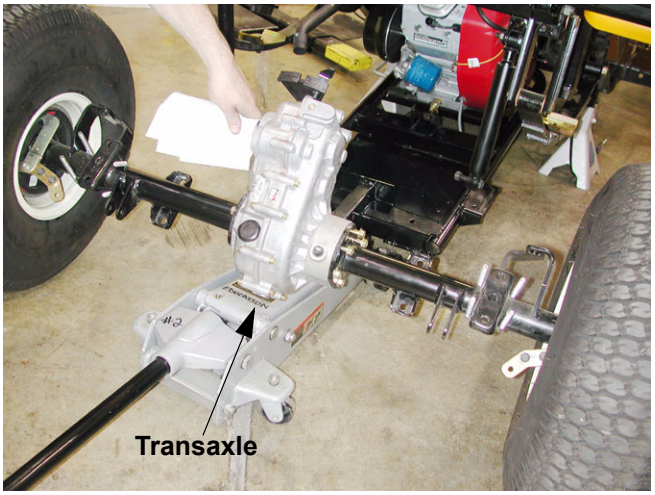

Figure 7.32

7.33. With the transaxle completely removed, the Big Country will be stable on the jackstands. See Figure 7.33.

Figure 7.33

8. TRANSAXLE INSTALLATION NOTES:

8.1. Reverse the removal procedure to install the transaxle. The following items are tips, reminders, and torque specifications.

8.2. When mounting the transaxle to the cradle, attach it loosely to the cradle using the four bolts through the brackets on the axle tubes. Before tightening them, position the front of the transaxle in the torque bracket and install the bolt that secures it. Once, in position, tighten all of the fasteners.

8.3. When jacking the transaxle and cradle up to meet the leaf springs, confirm that the locator dowel on the bottom of each spring is seated in its hole on the spring perch bracket.

8.4. Apply a small amount of anti-sieze compound to the input shaft before installing the driven pulley.

8.5. Fill the transaxle with 20-24 fl. oz. of SAE30 engine oil or 80W90 gear lube by pouring it into the fill hole covered by the black plug. Cub Cadet Drive System Fluid Plus is and acceptable premium alternative.

8.6. When correctly filled, on level ground, the level should be 4 1/2” to 5” down, measured from the top of the casting, adjacent to the hole.

8.7. Double-check brake adjustment before returning the vehicle to service.

- It should take 50 lbs. of pressure to set the parking brake.
- Once set, the parking brake should be able to hold the vehicle, loaded to capacity, on a 22 degree grade.
- The brakes should not drag when the pedal is released.
- One rear wheel should not lock-up before the other under hard application.
- It may be necessary to pull the slack out of the cables to install the clevis pins previously removed.
- Secure the clevis pins with new cotter pins.

8.8. Unless otherwise specified, use releasble thread locking compound such as Loctite 242 (blue) and tighten to the following torques:

- Shock absorber bolts: 35 ± 5 ft.-lbs.
- Drain plug: 20 ± 5 in.-lbs.
- Differential lock lever clamp bolt: 72 ± 10 in.-lbs.
- Differential lock actuator bracket bolts:
- Shift wedge screw: 20 ± 5 in.-lbs.
- Bracket: f-n-r actuator, vacuum reservoir, and neutral switch, top:72 ± 10 in.-lbs.
- Bracket: f-n-r actuator, vacuum reservoir, and neutral switch, side: 96 ± 10 in.-lbs.
- U-bolts: 23 ± 3 ft.-lbs.
- Torque bracket bolt: 72 ± 10 in.-lbs.
- Driven pulley bolt: 80 ± 10 ft.-lbs.
- Lugs: 55-60 ft.-lbs. (NO thread locking compound)

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9. LINK ASSEMBLY

9.1. The link assembly (aka:dogbone joint) connects the engine and transaxle cradle to the frame of the Big Country. This joint locates the front of the cradle, yet allows enough freedom of movement that the cradle can swing up and down and pivot axially to accommodate suspension travel. See Figure 9.1.

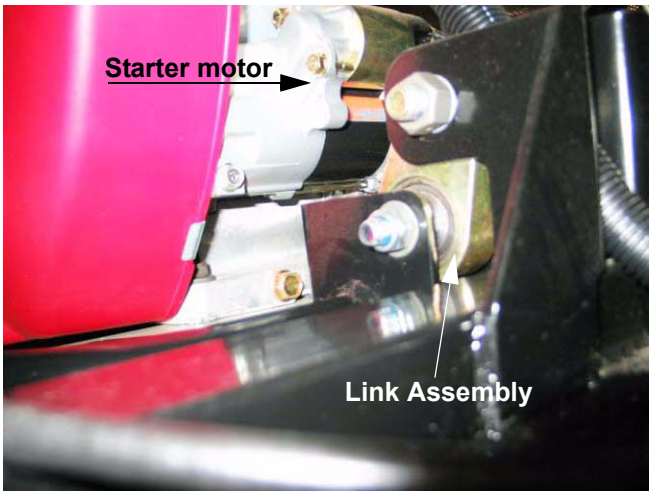

Figure 9.1

9.2. If the link assembly becomes worn or damaged, the front of the engine and transaxle cradle may shift and clunk, particularly when acceleration or braking load is applied. To replace the link assembly, use the following procedure:

9.3. Tilt the passenger seat forward, and lift out the parcel bin. This will provide easy access to the link assembly fasteners. See Figure 9.3.

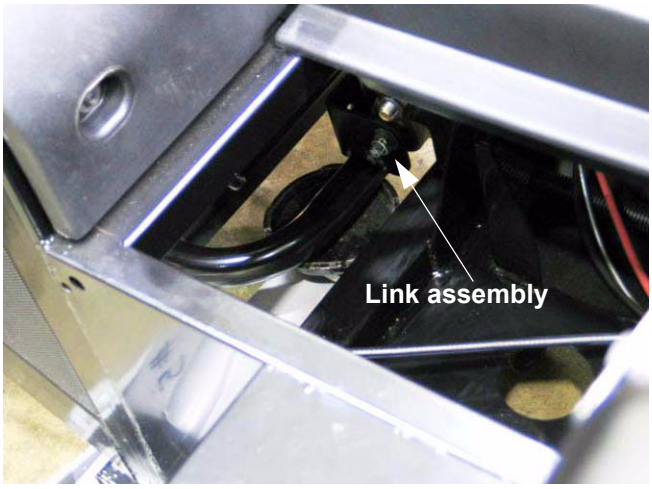

Figure 9.3

9.4. Open the hood, and disconnect the negative battery cable. Tools will be in close proximity to the "hot" stud on the starter motor.

9.5. It is not absolutely necessary to support the front of the engine and transaxle cradle with a jack, but it may make it easier to relieve any bind on the bolts that connect the cradle, link assembly, and frame.

9.6. Remove the nut and bolt (top) that connect the link assembly to the frame using a pair of 15/16" wrenches.

9.7. Remove the nut and bolt (bottom) that connect the link assembly to the engine and transaxle cradle using a pair of 19mm wrenches.

9.8. With the bolts removed, the link can be lifted out and replaced. See Figure 9.8.

Figure 9.8

9.9. Installation notes:

- Apply anti-seize compound to the bolts so that they may be easily removed in the future.
- Tighten the top nut and bolt to a torque of 100 ± 10 ft.-lbs.
- Tighten the bottom nut and bolt to a torque of 40 ± 5 ft.-lbs.

10. TRANSAXLE ORIENTATION

10.1. The transaxle is a Dana / Spicer model H12 FNR. Before disassembly, become familiar with and match-mark the components to establish orientations for assembly.

10.2. This is a bench procedure. For any internal repairs, the transaxle must be removed from the vehicle. See Figure 10.2.

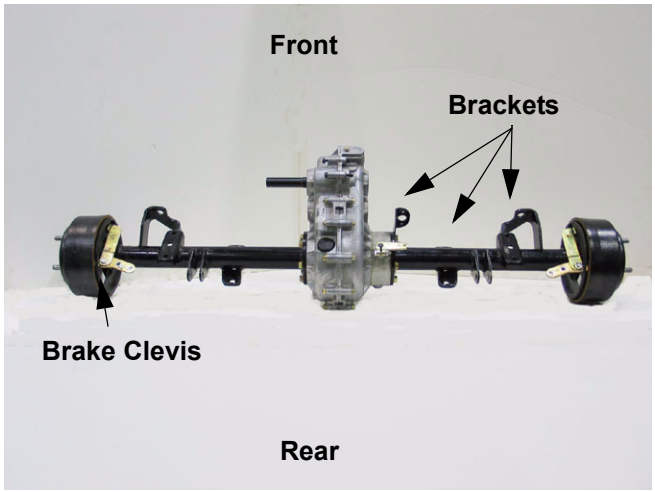

Figure 10.2

10.3. Viewing the transaxle as it would be oriented in the utility vehicle, with the input shaft to the left hand side and the black rubber fill / check plug facing up, directly above the axle tubes:

10.4. The vent valve is on the top of the right-side housing. Remove it using a 7/16” wrench. See Figure 10.4.

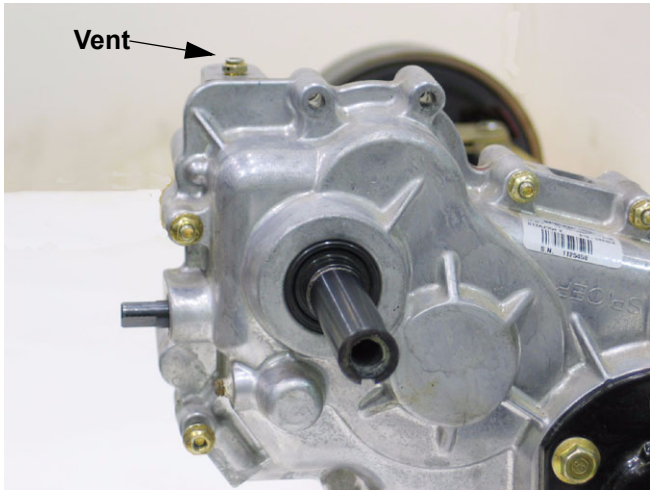

Figure 10.4

10.5. The top two holes for the bolts that connect the left and right halves of the housing will be vacant. The bracket that supports the vacuum reservoir, the F-N-R actuator, and the neutral switch is secured to these points. The bracket is also bolted to two mounting bosses on the front of the right side housing.

10.6. If not previously removed, take-off the bracket for the differential lock actuator using a 9/16” wrench. It is held by the same bolts that hold the right side axle tube and differential lock housing to the transmission housing. The mounting flange on the bracket should be vertical, toward the front of the transaxle. See Figure 10.6.

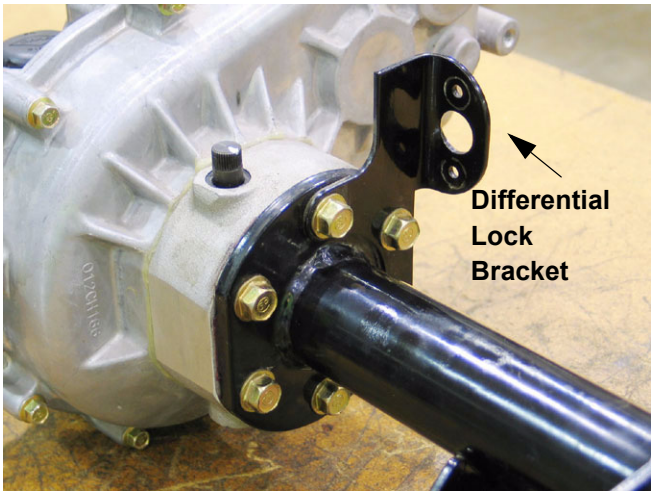

Figure 10.6

10.7. If not previously removed, the differential lock lever should be parallel to the axle tubes, with the clamp bolt to the rear when the differential lock is engaged (lever pulled forward). It may be necessary to rotate one of the axle shafts while applying light forward force to the lever to engage the differential lock. The lever is easily removed using a pair of 7/16” wrenches.

10.8. The axle tubes are oriented so that the brake actuators are at the top, and the brake cable brackets extend toward the front of the vehicle. The flats on the mounting flanges at the inboard end of both axle tubes align with the flats on the housing.

NOTE: The left side axle is roughly 1 3/4” shorter than the right (differential lock) side.

NOTE: The axle bearings are greased, with sealed bearings at each end. They are not lubricated by the oil within the housing.

10.9. The F-N-R shift shaft is located on the front surface of the housing. A 5/16” wrench spans the flats of the double-D shaft, and can be used in place of the shift wedge. See Figure 10.9.

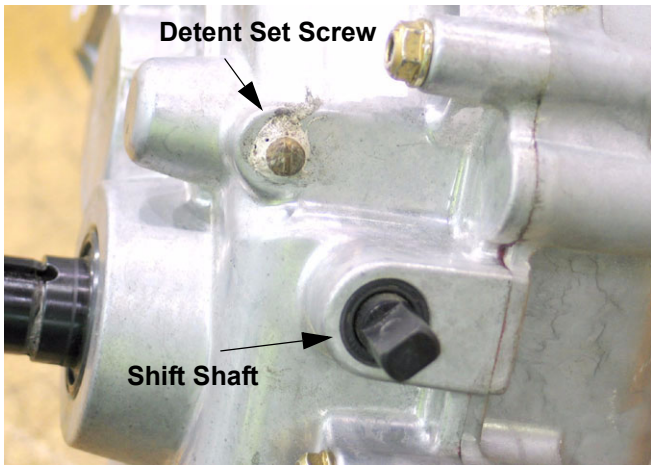

Figure 10.9

10.10. The detent set-screw is located on the front of the left side housing beneath the shift shaft, opposite the lower mounting boss for the bracket that holds the shift actuator, vacuum reservoir, and neutral switch.

11. TRANSAXLE DISASSEMBLY: AXLE TUBE REMOVAL AND CASE SEPARATION

11.1. With the drained transaxle positioned on a stable workbench, remove the six bolts that hold the right axle tube and differential lock housing to the transaxle housing using a 9/16” wrench.

NOTE: Removing the brakes prior to removing the axle tubes will reduce their weight, but is not strictly necessary.

NOTE: It is not strictly necessary to remove the axle tubes in order to separate the two halves of the housing, but it will be the path taken for most service procedures.

11.2. Separate the axle tube from the differential lock housing. See Figure 11.2.

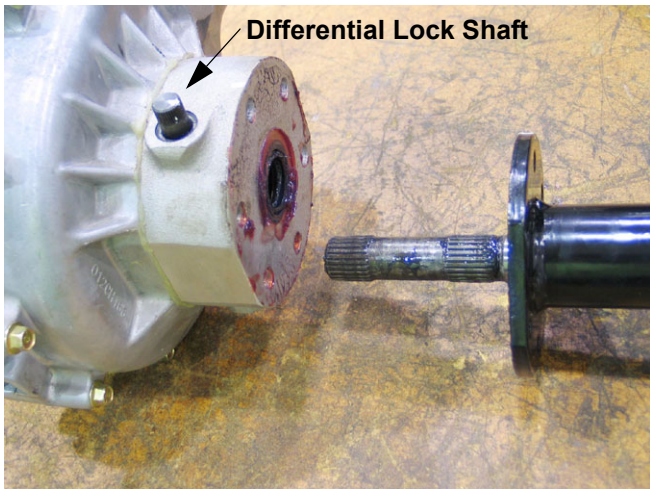

Figure 11.2

11.3. Repeat this procedure to separate the left side axle tube from the housing.

NOTE: Because the joint between the axle tube and the differential housing does not need to be oil-tight. It is sealed with grease.

11.4. Remove the detent set screw using a straight-blade screwdriver. Retrieve the detent ball and spring from the detent screw bore using a magnet. See Figure 11.4.

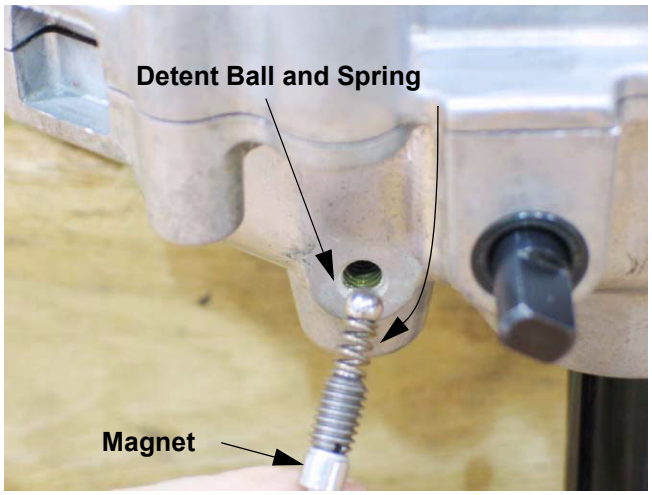

Figure 11.4

11.5. Position the housing differential lock side-up on 4x4 dimensional lumber, or a similar support. See Figure 11.5.

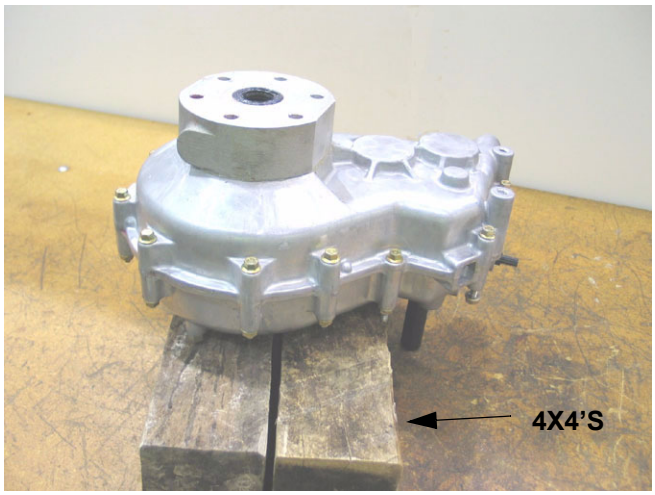

Figure 11.5

11.6. Remove the perimeter bolts that fasten the two housing halves together using a 3/8' wrench and a 7/16" wrench.

11.7. Use the square recessed pry-points to separate the housing halves. See Figure 11.7.

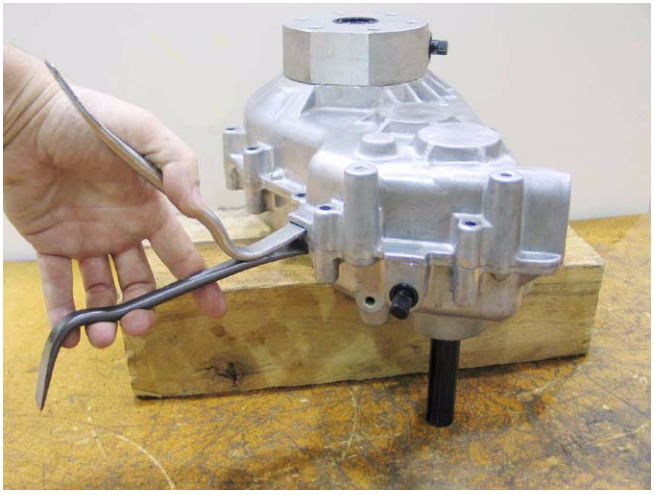

Figure 11.7

11.8. Separate the differential lock housing from the right side transaxle housing.

NOTE: The sealant is extremely tenacious.

11.9. Disengage the differential lock dog from the pin on the differential lock shaft. Lift the dog out of the housing and push the differential lock shaft out of the differential lock housing. See Figure 11.9.

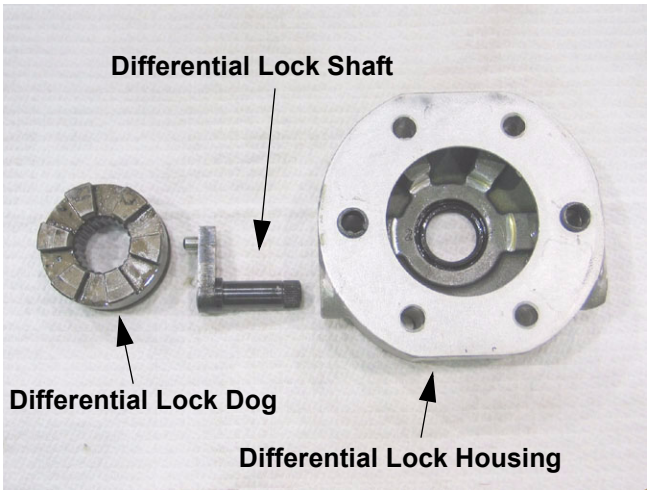

Figure 11.9

11.10. Remove the two seals (axle shaft and differential lock shaft) from the differential lock housing. They will not be re-used.

11.11. Clean all sealant and lubricants from the housings.

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12. TRANSAXLE DISASSEMBLY: GEAR SET REMOVAL AND DISASSEMBLY

12.1. Carefully lift the differential and ring gear assembly out of the left side housing. Set it aside in a clean, safe place. See Figure 12.1.

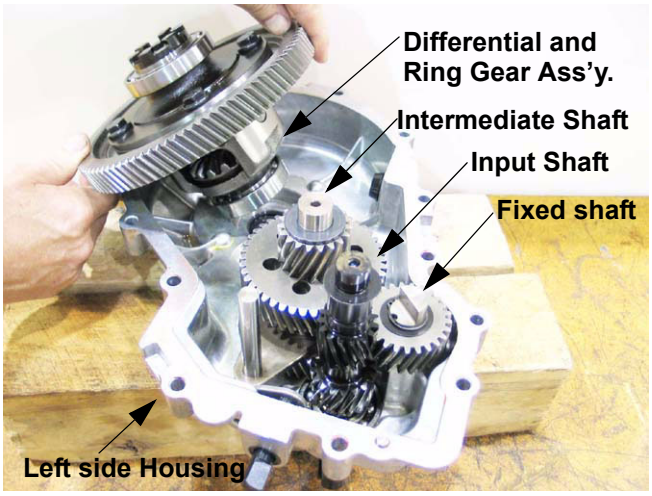

Figure 12.1

12.2. Remove the retaining ring that secures the idler gear to the fixed shaft in the housing.

12.3. Lift the following items off of the fixed shaft: keyed thrust washer, idler gear, and plain thrust washer (.030" thick). Set them aside in a clean safe place. See Figure 12.3.

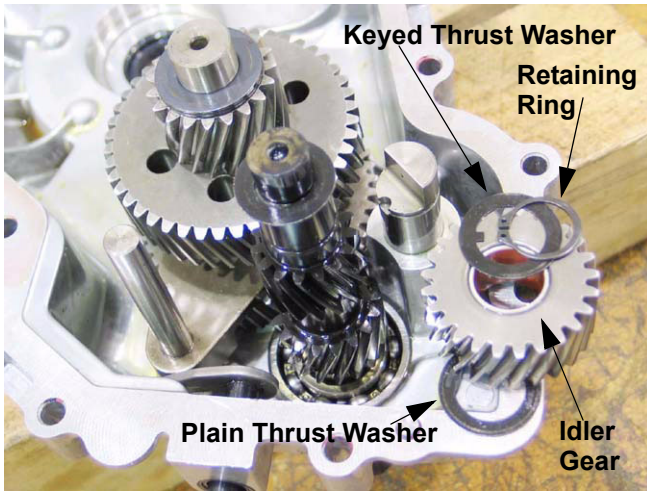

Figure 12.3

12.4. Lift the input shaft and thin thrust washer (.030" thick) from the housing. See Figure 12.4.

Figure 12.4

12.5. Lift the thick thrust washer (.110" thick) and final drive pinion off of the intermediate shaft. Set gears aside in a clean safe spot, maintaining sequence (take note of position and orientation). See Figure 12.5.

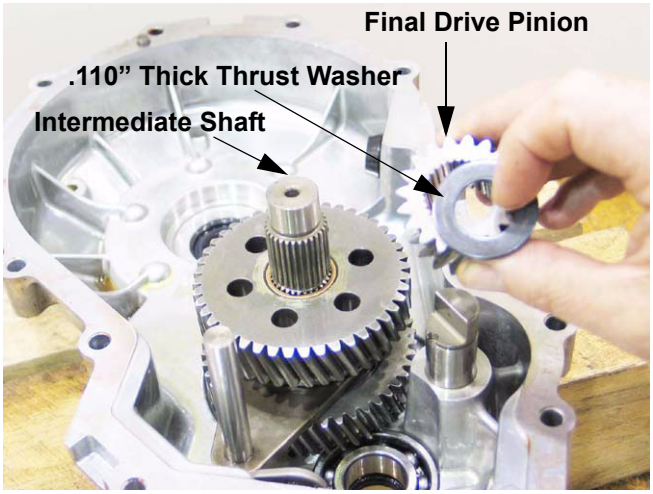

Figure 12.5

12.6. Lift the reverse gear off of the intermediate shaft. See Figure 12.6.

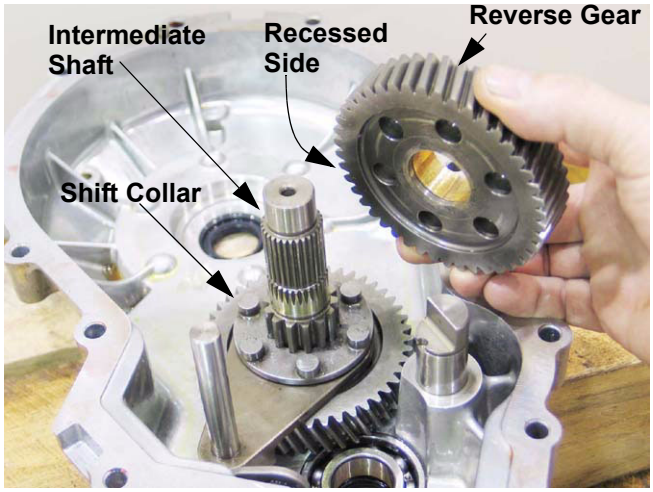

Figure 12.6

NOTE: The reverse gear has smaller O.D. and larger I.D. than the forward gear.

NOTE: The recessed side faces the shift collar.

12.7. Lift the shift collar off of the intermediate shaft together with the shift rod assembly. The pin on the shift rod assembly should disengage from the slot in the shift actuator as it is lifted out. See Figure 12.7.

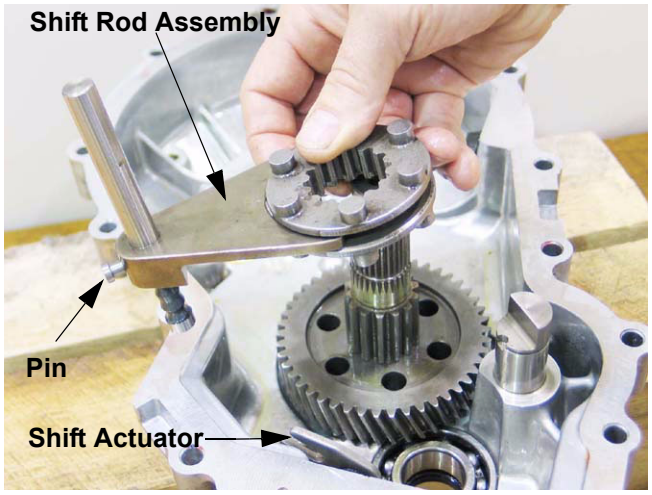

Figure 12.7

12.8. Remove the intermediate shaft. See Figure 12.8.

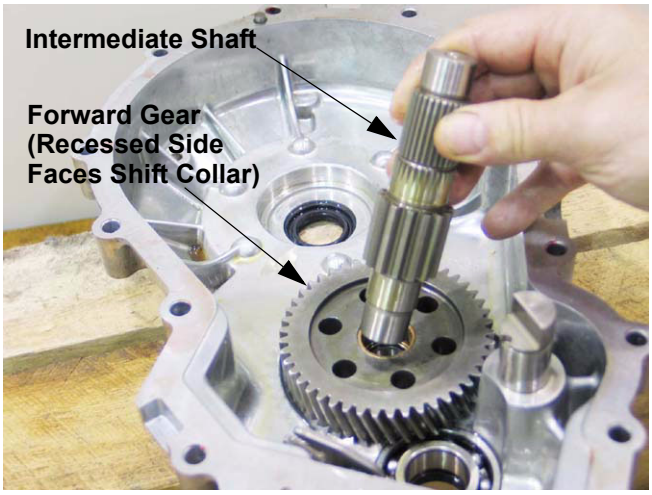

Figure 12.8

12.9. Lift the forward gear out of the housing. The forward gear has a smaller I.D. and a larger O.D. than the reverse gear does. See Figure 12.9.

Figure 12.9

NOTE: The recess in the forward gear faces up, toward the shift collar, the flat side faces the housing.

12.10. Remove the thick (.110” thick) thrust washer from case. It may sometimes remain stuck to the forward gear, because of vacuum and oil adhesion.

4 X 2 Drive System - (Steel Bed)

12.11. Push the shift actuator into the case, and remove it. See Figure 12.11.

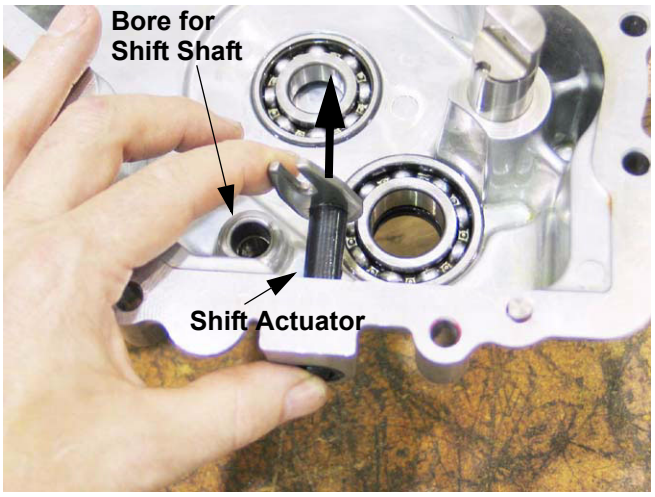

Figure 12.11

12.12. Remove the seals from the case. There are three on the left side housing: input shaft seal, axle seal, and shift actuator seal. Do not re-use the seals. See Figure 12.12.

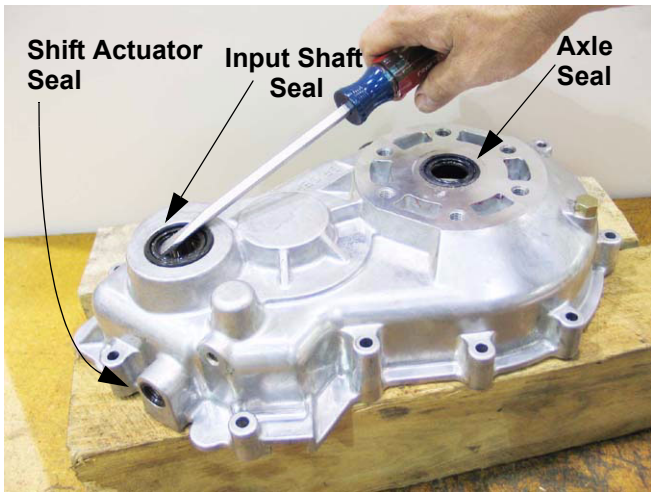

Figure 12.12

12.13. Check the bearings in both sides of the housing for any signs of damage (looseness, tightness, discoloration, rough operation). If damage is found, remove and discard the damaged bearing or bearings.

NOTE: Only remove the bearings if they are to be replaced. Do not re-use bearings that have been removed.

12.14. The input shaft bearing can be driven out of the housing. See Figure 12.14.

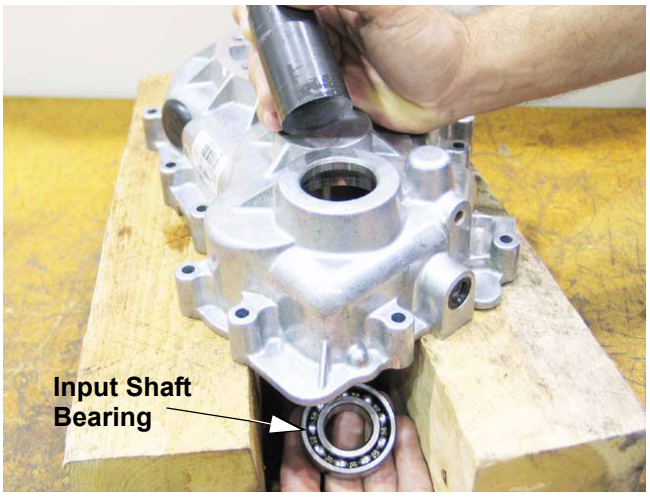

Figure 12.14

NOTE: The input shaft seal may be pushed through as well. There is not a shoulder in the bore.

12.15. The intermediate shaft bearing and the bearings in the right side housing will require a blind bearing puller and/or judicious application of heat. See Figure 12.15.

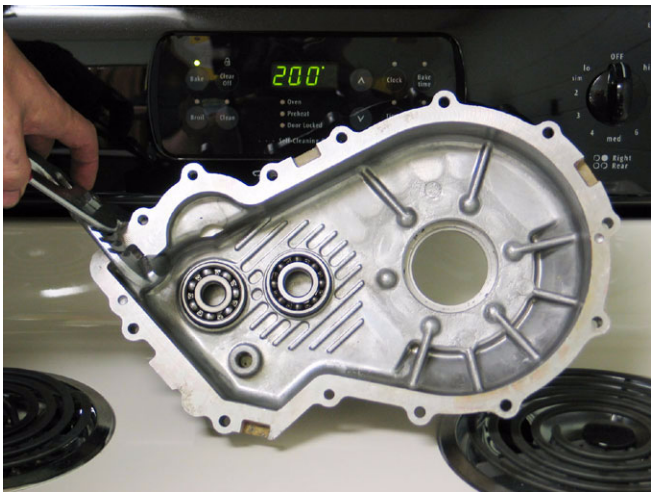

Figure 12.15

12.16. Careful application of a propane torch (NOT oxy-accetelene), or heating the housing in an oven for about ten minutes at 250 deg. F. will expand the alloy housing faster than the steel bearing, allowing for easy removal of the bearing.

NOTE: An oven that is to be used for food preparation should not be used for transmission preparation.

12.17. Clean and inspect the gears, shafts, shift collar, and housings. See Figure 12.17.

Figure 12.17

- Visually check the gears for: worn or damaged teeth, worn holes that engage the dogs on the shift collar, discoloration, scoring or metal transfer on the recessed surface, or damaged inner bushings. The gear should be replaced if the inner bushing is discolored, scored, or non-circular.
- Visually check the shafts for: worn or damaged teeth, discoloration, or damage to any bearing surfaces.
- Visually check the shift collar for worn or rounded dogs, cracks, or discoloration. If there is significant damage to the shift collar or the shift collar's engagement points on the forward and reverse gears, shift linkage maladjustment or improper use may be the core problem.
- Inspect the differential assembly. Differential repair, if necessary, is covered in a separate section.

12.18. Replace any suspect parts and assemble the transaxle.

- If the input shaft or the bearings that carry it have been replaced, test-assemble the housing without sealant and check shaft end-play with a dial indicator. Shim it as necessary to obtain .002 to .006 end play. There is a shim kit described in the Illustrated Parts List.
- Warming the transaxle housings, or chilling the bearings prior to installation will ease the process.
- Seal the two halves of the housing together with a non-silicone based gasket material such as Loctite 518 (red) sealant.
- On the bolts securing the housing halves together, use new self-locking nuts or apply a thread locking compound such as Loctite 242 (blue) to the threads, and tighten them to a torque of 95 $\pm$ 10 in.-lbs.
- Protect seal lips during shaft installation, and press them flush with the housings using a seal driver. See Figure 12.18.

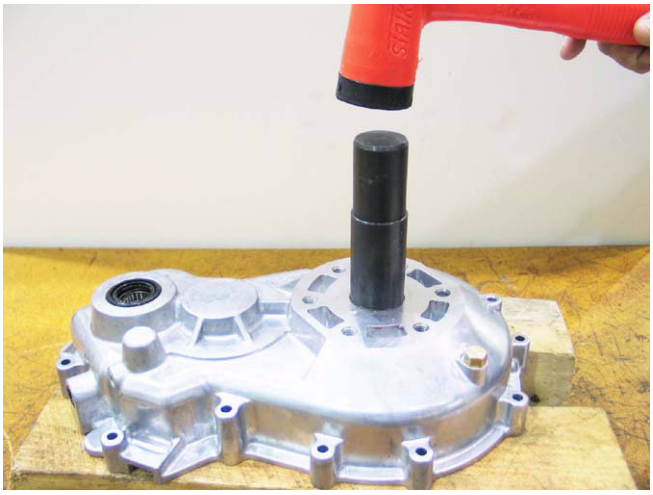

Figure 12.18

- Install new "O" ring on the drain plug, and tighten it securely.
- Install the detent ball, spring, and set screw in their bore. A small quantity of Teflon thread sealant may be used on the set screw. Tighten it until a shift torque of 8 to 14 ft.-lbs. is achieved at the shift actuator assembly.

13. TRANSAXLE DISASSEMBLY: DIFFERENTIAL

13.1. Position the differential assembly so that it rests on the differential lock dogs. The nuts on the ring-gear bolts should face up.

13.2. Remove the four bolts that hold the ring gear to the differential assembly using a pair of 9/16" wrenches. See Figure 13.2.

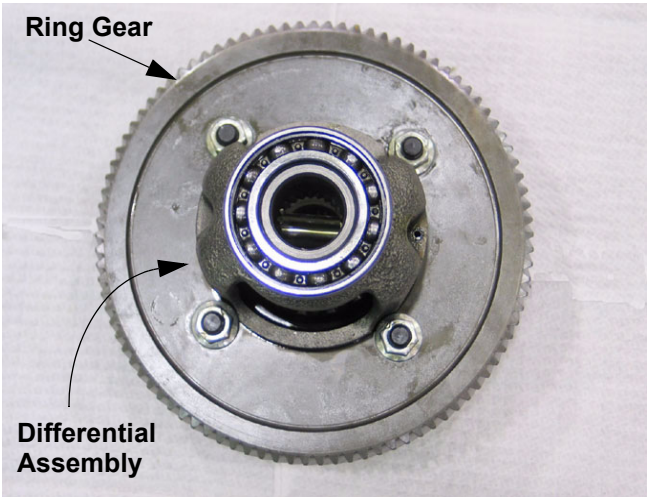

Figure 13.2

NOTE: When installing the ring gear:

- Do not re-use the locking nuts, replace them.
- The bolts must enter the assembly from the differential housing (differential lock dog) side.
- Tighten the bolts to a torque of 55-63 ft.-lbs.
- Do not substitute standard hardware for the ring gear bolts.
- The ring gear is installed from the miter gear side of the differential, so that the mounting flange nests in the deeply recessed side of the ring gear.

13.3. Lift the ring gear off of the differential. See Figure 13.3.

Differential Housing (ring gear removed)

Figure 13.3

13.4. Lift the differential housing (containing the miter gears) off of the differential housing end plate (with differential lock dog machined into it). See Figure 13.4.

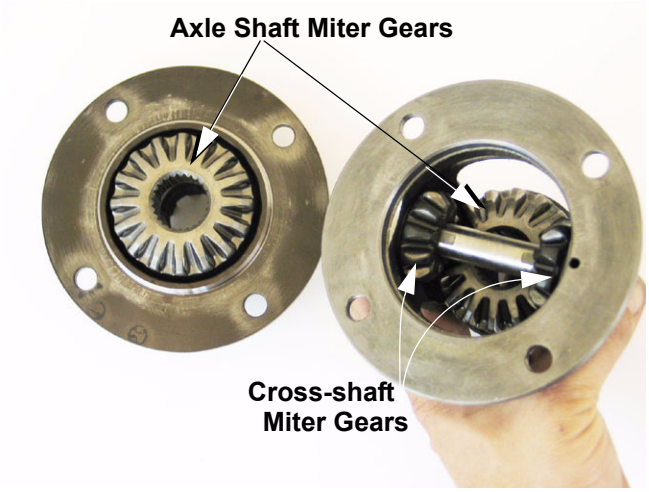

Figure 13.4

13.5. The axle shaft miter gear can be lifted out of the end plate.

13.6. Check the bearing for rough rotation, or any other signs of damage.

NOTE: If the bearing is removed, it should be replaced with a new bearing. If the bearing is good, do not remove it.

13.7. If it is necessary to remove the bearing, use a bearing puller. See Figure 13.7.

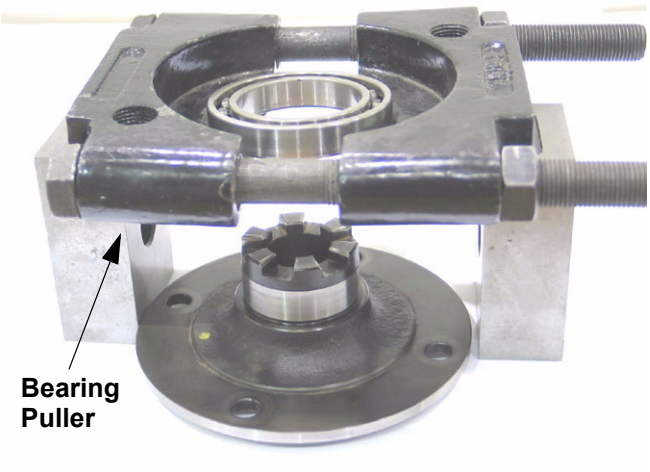

Figure 13.7

13.8. Position the differential housing so that a flat-nosed drift can be used to drive-out the tension pin that secures the cross-shaft.

13.9. Drive out the pin and remove the cross-shaft. See Figure 13.9.

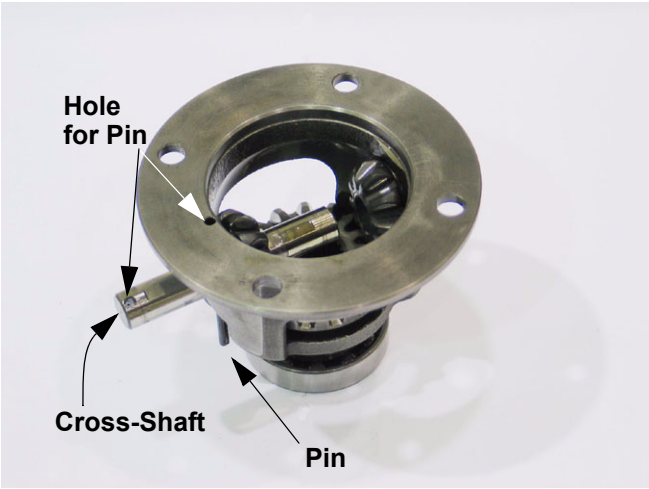

Figure 13.9

13.10. Lift the miter gears and thrust washers out of the differential housing. See Figure 13.10.

Figure 13.10

13.11. The axle shaft miter gear, and the thrust washer that goes beneath it can be lifted out of the end plate. See Figure 13.11.

Figure 13.11

13.12. Check the bearing for rough rotation, or any other signs of damage.

NOTE: If the bearing is removed, it should be replaced with a new bearing. If the bearing is good, do not remove it.

13.13. If it is necessary to remove the bearing, use a bearing puller. See Figure 13.13.

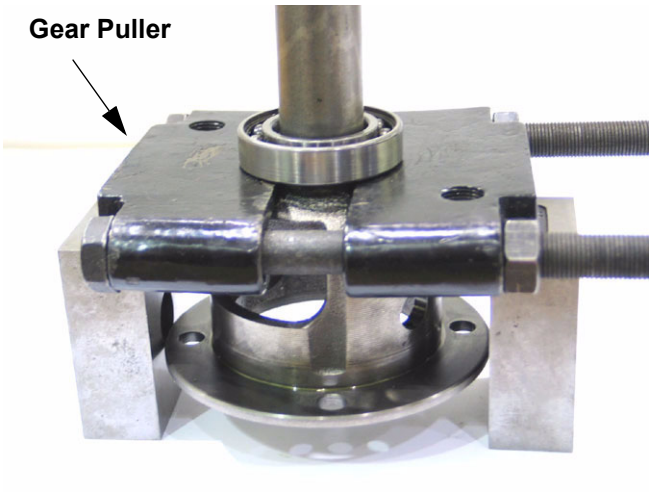

Figure 13.13

14. TRANSAXLE: AXLE TUBES

14.1. If brake drum has not already been removed from the axle tube, perform the following steps:

14.2. Remove the brake drum. See Figure 14.2.

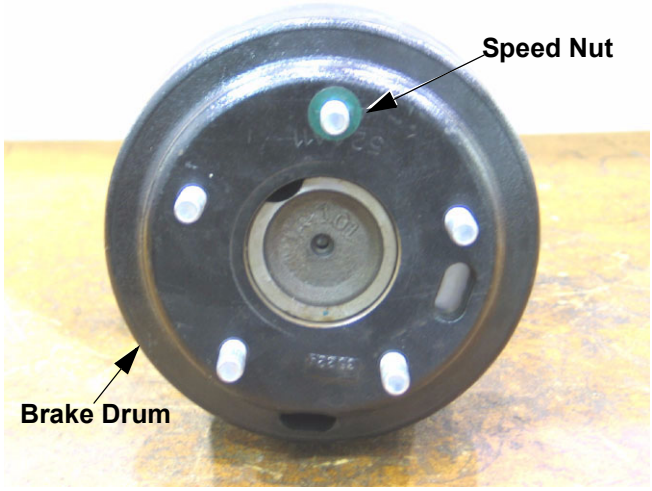

Figure 14.2

NOTE: On transaxles that have never had the brake drum removed, there may be a speed nut on one of the studs. The speed nut is there for factory assembly and shipping purposes. It can be removed and discarded.

14.3. Remove the R-shaped clips that hold the brake actuator to the brake shoes, and remove the actuator. See Figure 14.3.

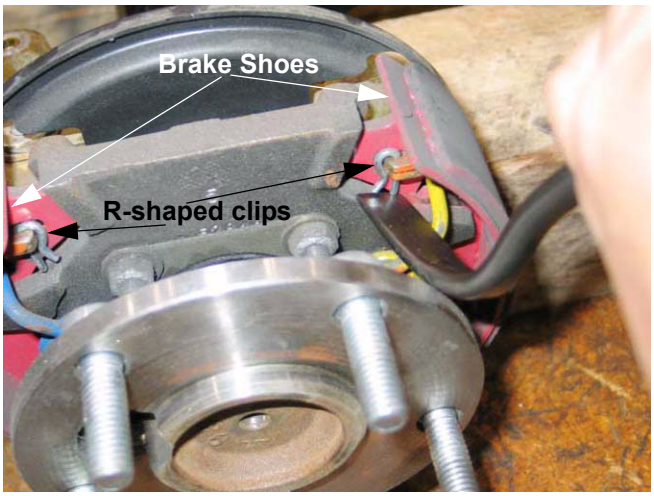

Figure 14.3

14.4. Remove the brake shoes:

- Release the small blue tension spring adjacent to the brake adjuster.
- Remove the brake adjuster
- Pry the tail of each torsion spring over the lip that it seats behind on the cast brake bracket.
- Lift away the shoes and springs.

14.5. Remove the nuts from the four socket-head cap screws that hold the brake bracket assembly to the axle tube using a 1/2” wrench. See Figure 14.5.

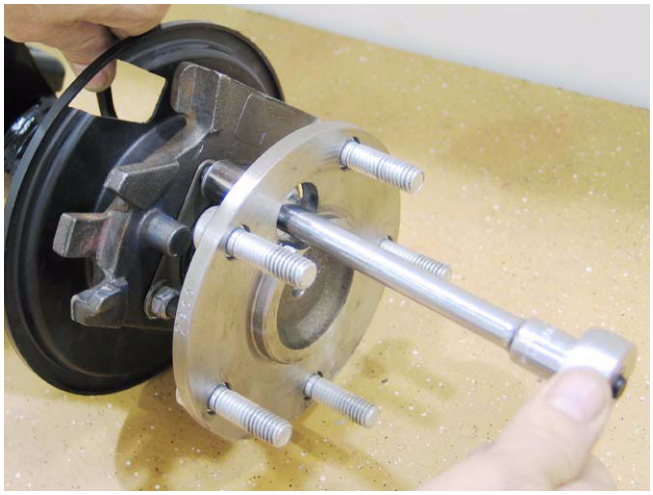

Figure 14.5

NOTE: The socket head cap screws have a flat ground on the head. The flat seats against the axle tube to keep them from rotating. If an allen wrench is necessary, it will be 1/4”.

14.6. Slide the axle shaft, bearing, and brake bracket assembly out of the axle tube. See Figure 14.6.

Figure 14.6

14.7. It may be necessary to use a slide hammer to draw the bearing race out of the axle tube. See Figure 14.7.

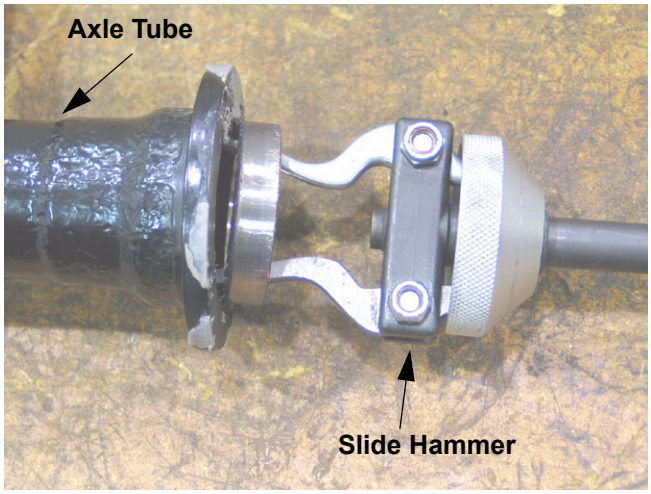

Figure 14.7

14.8. There is an axle seal in the tube, beyond the race. It can be driven out with a long shaft inserted from the far end of the axle tube.

14.9. To remove the bearing from the axle shaft, it is necessary to split the pressed on retaining ring adjacent to the bearing. If the bearing is removed, it must be replaced with a new one.

4 X 2 Drive System - (Steel Bed)

14.10. Drill a small (1/8" or less) pilot hole into the outside edge of the retaining ring. Drill most of the way through the ring, but do not drill into the axle shaft. Enlarge the hole with a 1/4" bit. See Figure 14.10.

Figure 14.10

14.11. Split the ring with a cold chisel. Once the tension on the ring is relieved, it will slide easily off the axle shaft. See Figure 14.11.

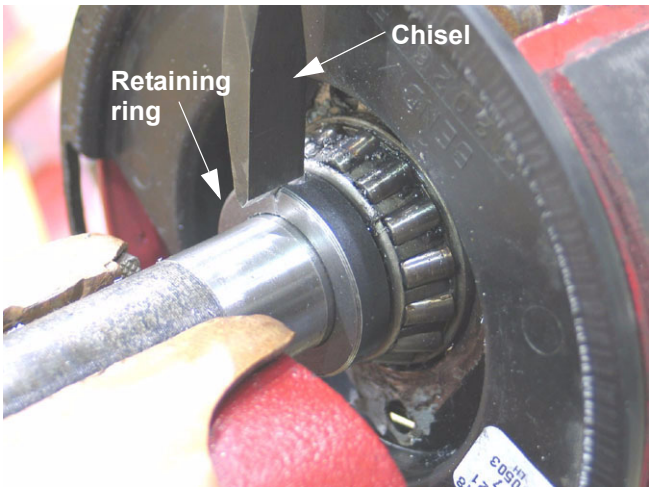

Figure 14.11

14.12. The bearing must be pressed off of the shoulder on the axle. The plastic dust cover may separate from its metal mounting plate in the process. See Figure 14.12.

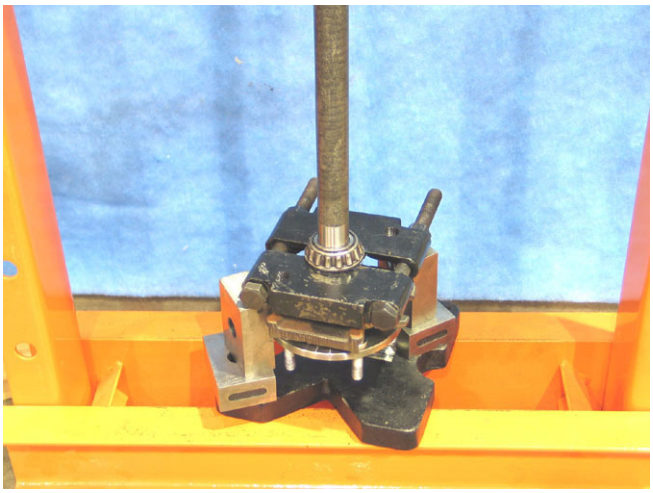

Figure 14.12

14.13. Clean and inspect all the components, and replace any that are damaged.

14.14. Install a new axle bearing inner seal in the axle tube using a driver that applies force to the outside diameter of the seal. The seal lip should face in.

14.15. Install a new bearing race in the axle tube. See Figure 14.15.

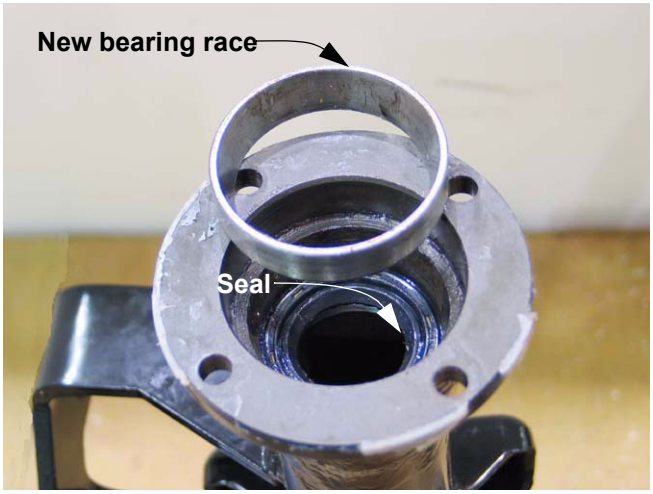

Figure 14.15

14.16. Clean the axle, apply a small amount of motor oil or wheel bearing grease to the surface that the axle bearing outer seal rides on, and install a new seal onto the axle. The side of the seal with the embossed words “THIS SIDE OUT” should face the wheel flange.

14.17. Position the brake bracket assembly, then the dust cover assembly on the axle. The dust cover will not fit inside-out.

14.18. Pack the bearing with good quality wheel bearing grease, and install the bearing on the axle. See Figure 14.18.

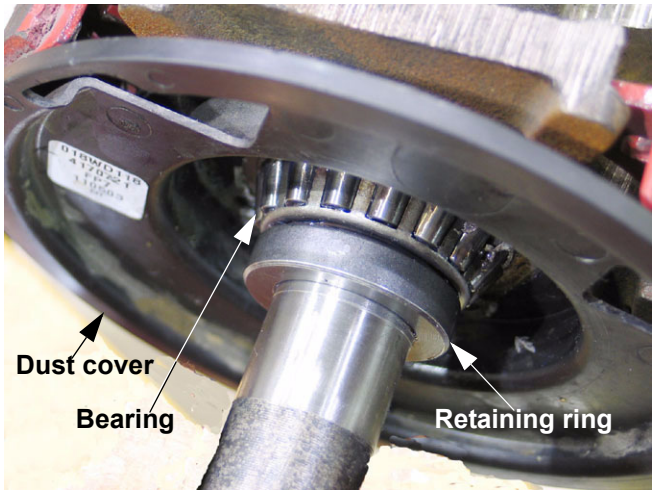

Figure 14.18

14.19. Press the retaining ring onto the shoulder that the axle bearing seats on, so that it holds the axle bearing snugly in place.

14.20. Lubricate the finished surface near the retaining ring with motor oil or gear lube.

14.21. Insert the axle into the axle tube.

14.22. Secure the brake bracket assembly and the dust cover assembly to the axle using the four socket head cap screws and nuts. Tighten them to a torque of 200 ± 20 in.-lbs. using a 1/2” wrench.

NOTE: To orient the brake bracket assembly to the axle tube and dust cover:

- The flats on the inner axle tube mounting flange face front and rear.
- The cable bracket extends forward of the axle tube.
- The large flat bosses that the top of the brake shoes contact goes to the top.
- The rectangular holes in the dust cover should be near the flat bosses, for the brake actuator arm to fit through.
- The right side axle tube is shorter than the left one, to accommodate the differential lock housing.
- The right side axle shaft has two lengths of splines separated by about 1 1/2” of shaft.

14.23. When assembling the axle tubes to the housing: See Figure 14.23.

- Thoroughly clean all traces of old sealant and lubricants from the mating surfaces.
- Apply a bead of non-silicone based sealant such as Loctite 518 to the mating surfaces.
- Install each axle tube, and secure them using the six bolts previously removed.
- The three top/front bolts on the right side axle tube secure the differential lock actuator bracket.
- Tighten the bolts to a torque of 25 to 35 ft.-lbs. using a 9/16” socket.

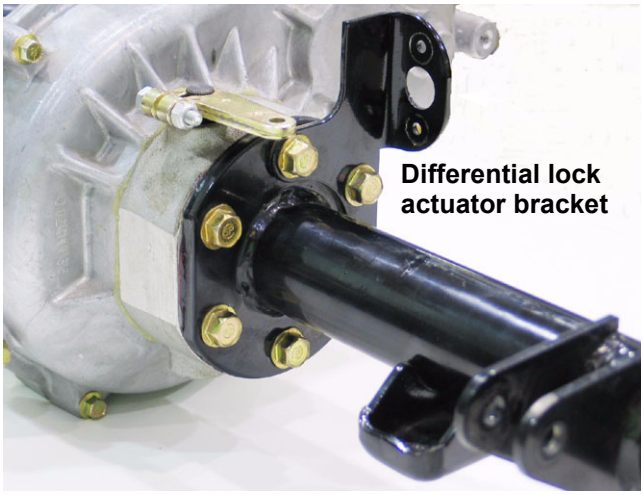

Figure 14.23

15. IN CRADLE ENGINE SERVICE

NOTE: Basic maintenance, valve adjustment, and fuel system repair can be easily accomplished without removing the engine from the vehicle. Any repair that requires the fan cover to be completely removed from the engine is most easily performed on the bench, with the engine removed from the vehicle. Fuel pump service and valve lash adjustment are two typical procedures that can be performed with the engine in place.

FUEL PUMP SERVICE

It may be necessary to replace the fuel pump if the following situations exist:

- Fuel pump pressure is less than .5 PSI, and other factors are eliminated: pinched line, leaky pick-up, blocked filter, loss of vacuum to pump.
- The fuel pump diaphragm has failed, causing fuel to enter the crankcase.

NOTE: Fuel pump performance may be checked without removing the pump.

15.1. Park the vehicle on firm level ground, and raise the bed to gain access to the engine.

15.2. Lift the four clips that secure the air filter cover. Remove the cover, pre-filter, and filter. See Figure 15.2.

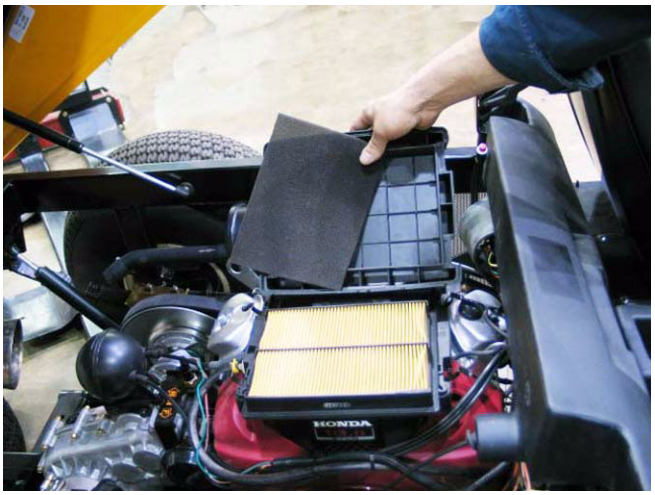

Figure 15.2

15.3. Remove the two screws holding the air filter base to the fan cover using an 8mm driver. Remove the two screws that hold the air filter base to the carburetor using a 10 mm driver. See Figure 15.3.

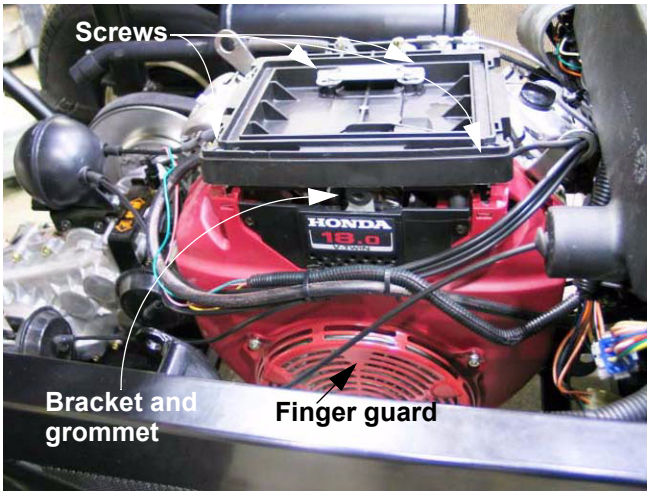

Figure 15.3

NOTE: The fan side of the air filter base is also located by a bracket and rubber grommet.

15.4. Remove the four nuts securing the finger guard using a 10 mm wrench. Remove the finger guard.

15.5. Remove the two phillips head screws that hold the fuel pump cover in place. Move the cover out of the way, along with the hoses, tubes, and wires that are secured to it with cable ties. See Figure 15.5.

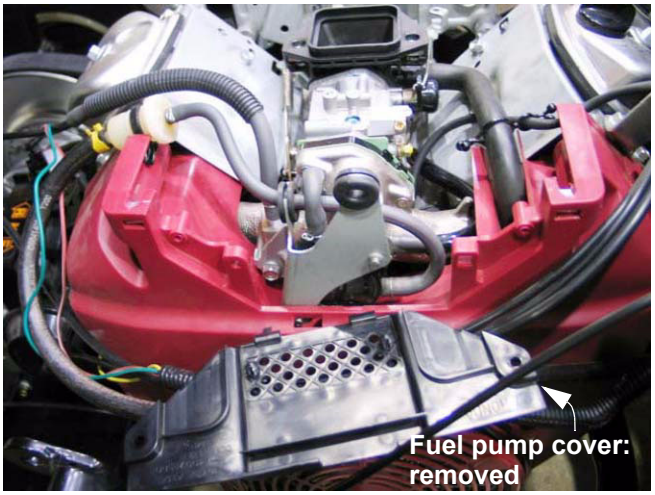

Figure 15.5

15.6. Remove the three screws securing the grid screen to the grid screen holder using a 10 mm wrench. Remove the grid screen. See Figure 15.6.

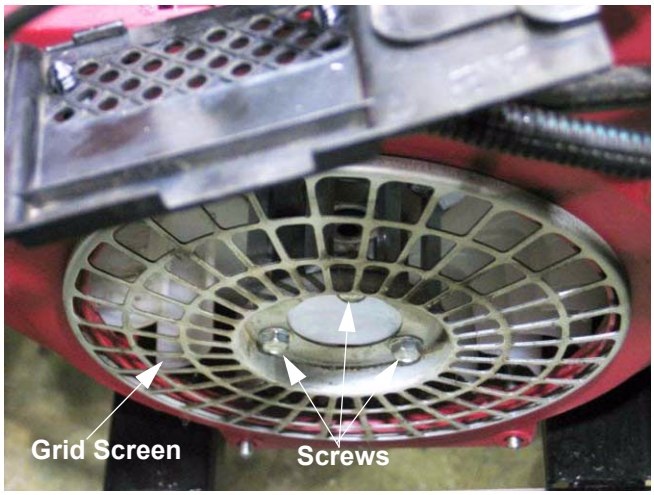

Figure 15.6

15.7. Remove the two screws that hold the top of the fan cover to the engine using a 10 mm wrench. Install one or two of the nuts that held the finger guard in place. Thread it on just far enough to keep the nut from falling off. See Figure 15.7.

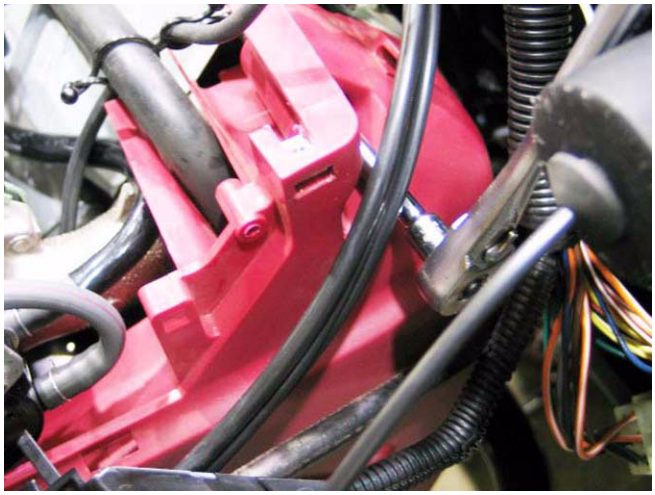

Figure 15.7

15.8. Pull the fan cover out just far enough to provide access to the fuel pump. The cover will not come completely off with the engine in place.

15.9. Remove the fuel pump bracket from the intake manifold using a 10 mm socket. See Figure 15.9.

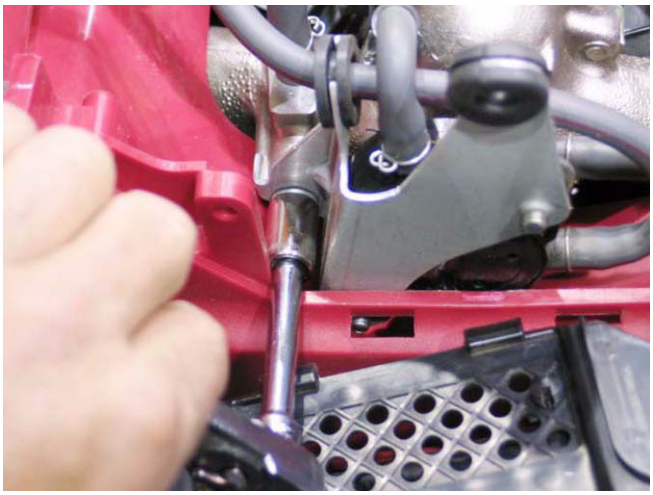

Figure 15.9

15.10. Note the position of the hoses that connect to the fuel pump. Disconnect the hoses, and remove the fuel pump. See Figure 15.10.

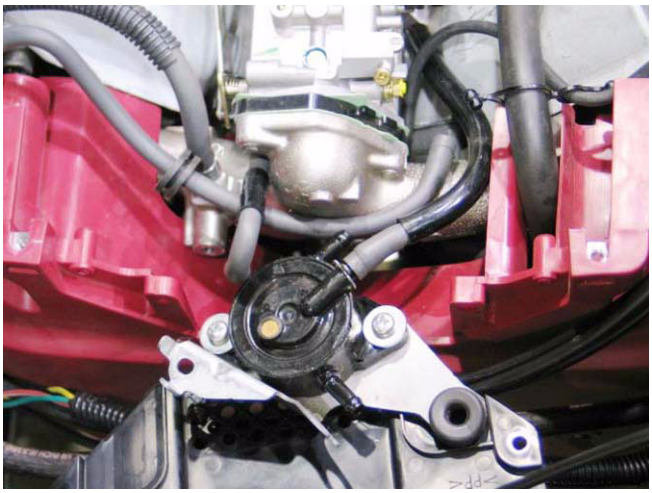

Figure 15.10

4 X 2 Drive System - (Steel Bed)

15.11. The fuel pump can be tested on the bench using a hand operated vacuum pump to confirm the initial tests. See Figure 15.11.

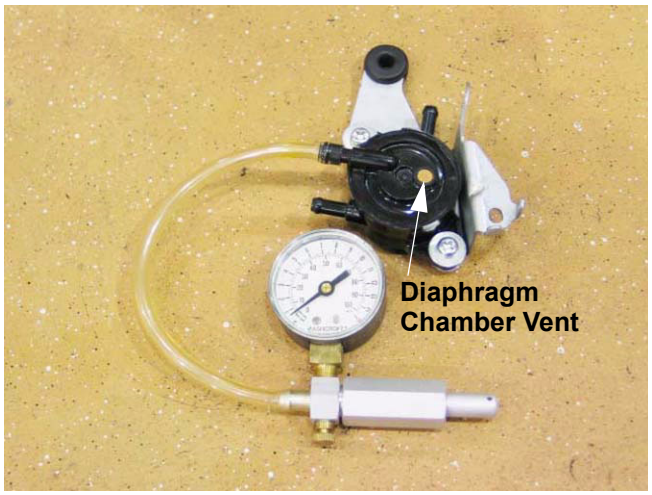

Figure 15.11

15.12. With the vent blocked, the diaphragm should be able to hold vacuum generated by the hand pump. See Figure 15.12.

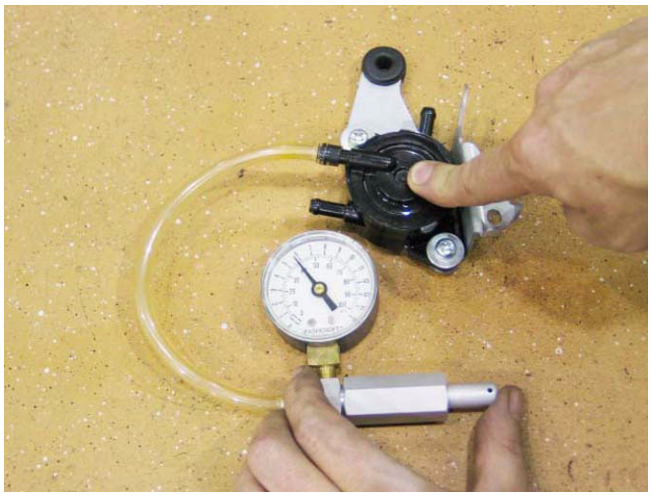

Figure 15.12

NOTE: Recommended replacement fuel pump: BS-808656

Valve Adjustment

Valve lash adjustment should be checked annually, or every 300 hours of operation, whichever comes first. If clatter is heard from the engine during operation, valve lash should be checked.

15.13. Park the Big country on firm level ground, and raise the bed to provide access to the engine.

15.14. Allow the engine to cool if it has been run, and clean any dirt away from the areas surrounding the valve covers.

15.15. The rear valve cover is easily accessible. Removing the plenum at the front of the engine compartment will ease access to the valve cover on the front cylinder. See Figure 15.15.

Figure 15.15

15.16. Disconnect the high tension leads from the spark plugs. Remove the Spark plugs using a 13/16" socket.

15.17. Remove the valve covers using a 10 mm wrench. Clean the valve covers, and inspect the valve cover gasket and sealing washer under the bolt head. Replace them if they are hardened, cracked, or damaged.

15.18. Rotate the engine crankshaft manually to locate top dead center (TDC) on the compression stroke for cylinder #1 (front cylinder). See Figure 15.18.

- Rotating the crankshaft clockwise (seen from the fan side of the engine) will produce a puff of air from the spark plug hole just before this point.
- TDC on the compression stroke can be confirmed by the valves being closed.
- There are timing marks on the fan cover that can be seen if the finger guard and grid screen are removed using a 10 mm wrench.
- Cylinder #1 “T” mark is at the upper right hand side of the fan cover. The mark on the fan should align with it at TDC compression #1.

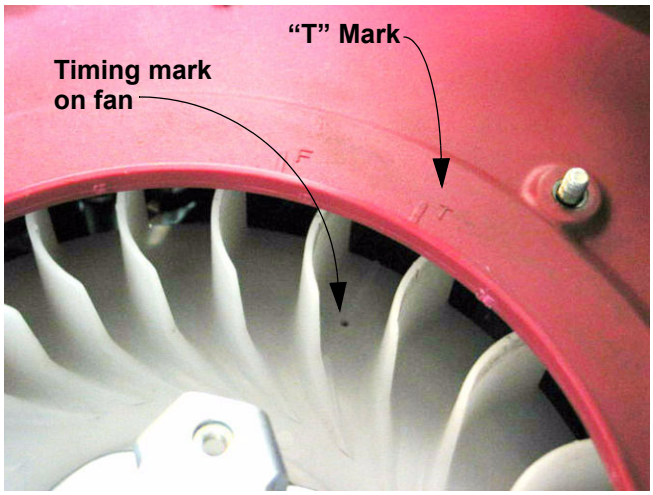

Figure 15.18

15.19. Check the clearance between the intake valve and the rocker arm that acts on it. Check the clearance between the exhaust valve and the rocker arm that acts on it.

- Intake valve clearance: 0.15 ± 0.02mm (.006”)
  Exhaust valve clearance: 0.20 ± 0.02mm (.008”)

15.20. If adjustment is necessary, hold the adjusting nut with a 14mm wrench, and loosen the jam nut with a 10mm wrench. Tighten the adjusting nut until slight drag is felt on the feeler gauge. Tighten the jam nut against the adjusting nut to secure it. Double-check the adjustment to make sure it did not slip during tightening. See Figure 15.20.

Figure 15.20

15.21. Install the valve cover.

15.22. Rotate the crankshaft 270 degrees clockwise to bring cylinder #2 to TDC position on the compression stroke. The mark on the plastic fan should align with the upper left “T” mark on the fan cover. See Figure 15.22.

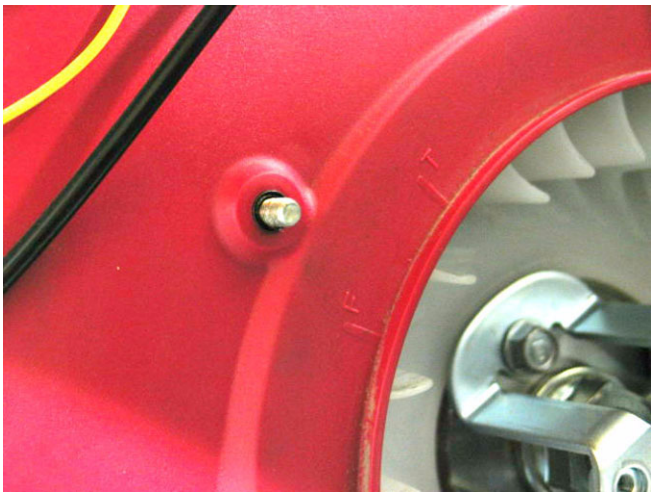

Figure 15.22

4 X 2 Drive System - (Steel Bed)

15.23. Adjust the clearance on cylinder # 2.

15.24. Install the valve cover. See Figure 15.24.

Figure 15.24

15.25. Install both spark plugs, and connect the high tension leads.

15.26. Lower the bed.

15.27. Test run the vehicle before returning it to service.