

TUFF-TORQ K61A TRANSAXLE SERVICE MANUAL

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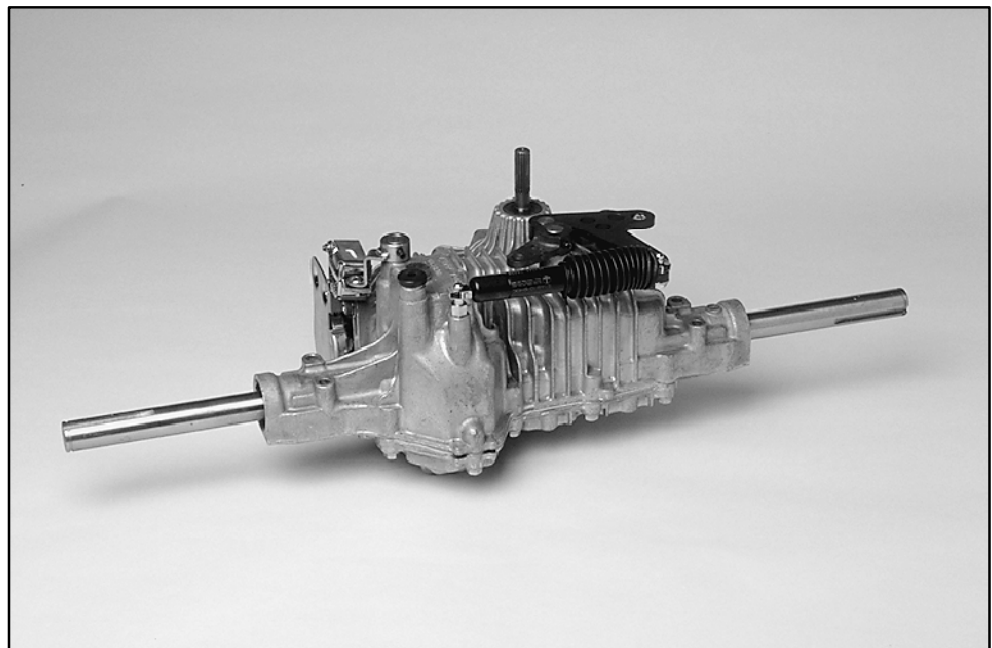
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Tuff-Torq®
K61A Transaxle

SERVICE MANUAL



About This Manual

This manual was written expressly for servicing Tuff Torq® K61A transaxles, as used in 1994–1999 260-Series Toro Wheel Horse tractors. The Toro Company has made every effort to make the information in this manual complete and correct.

This manual was written for the service technician; basic mechanical/electrical skills are assumed. The Contents page lists the systems and the related topics covered in this manual.

We hope that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Consumer Service Department
8111 Lyndale Avenue South
Bloomington, MN 55420–1196

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Bloomington, MN 55420 – U.S.A

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Safety Information



This symbol means WARNING or PERSONAL SAFETY INSTRUCTION—read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the Tuff Torq

model K61A hydrostatic transaxle. The tractor and attachment operator's manuals contain safety information and operating tips for safe operating practices. Operator's manuals are available through your local Toro distributor or:

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Think Safety First

Avoid unexpected starting of engine...

Always turn off the engine and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid injury from high pressure oil...

Keep body and hands away from pin hole leaks or nozzles that eject high pressure oil. Use cardboard or paper to locate hydraulic leaks. Oil escaping under high pressure can penetrate the skin and cause injury. Oil accidentally injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

Avoid laceration and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants.

Avoid asphyxiation...

Never operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine.

Specifications

Axle Torque Output

Rated:	215 ft. lb. (290 N•m)
Peak:	654 ft. lb. (880 N•m)
Maximum Input Speed	3000 RPM
Input Shaft Size	0.58 in. (14.85mm)
Reduction Ratio	26.97:1
Axle Shaft Size	1.0 in. (25.4mm)
Maximum Static Weight on Axle	584 lb. (265kg)
Weight — Dry	38 lb. (17.5kg)
Brake	Dry Band
Brake Capacity	288 ft. lb. (390 N•m) at 55 lb. (245N•m) Brake Arm Force
Differential	Automotive-Type Bevel Gears
Gears	Heat-Treated
Housings	Aluminum Die Castings
Tow Valve	Standard (Brake Release)
Oil	10W–30 API Service Class H or Higher
Oil Capacity	3.5 qt. (3.3 liter)
Ground Speed	
Maximum Forward	5.3 MPH (8.5km/hr)
Maximum Reverse	2.3 MPH (3.7km/hr)

Removing the Transaxle from the Tractor

Working from the bottom of the tractor, remove the transaxle drive belt tension spring and drive belt from the transaxle pulley.

Remove the access panel from the rear of the tractor, to expose the fuel tank/transaxle.

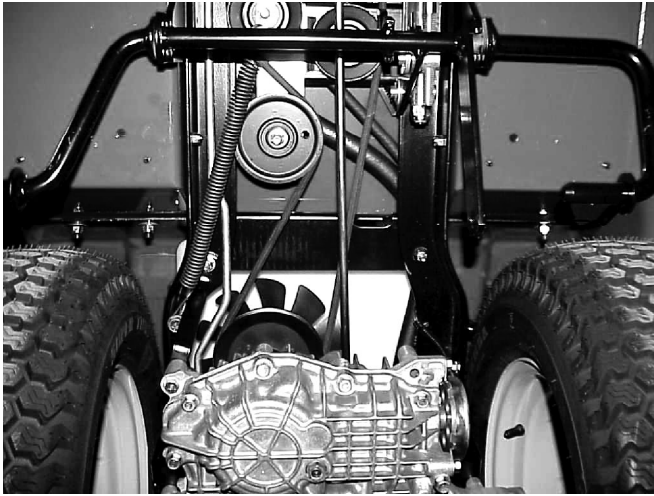


Figure 1

Disconnect the brake rod, control rod, tow valve rod, and reservoir hose from the top of the transaxle.

Support the rear of the tractor with jack stands and remove the rear wheels.

Remove the two bolts securing the transaxle support rods to the tractor frame.

Remove the four nuts from the U-bolts which hold the two axle shafts to the frame.

Remove the transaxle and place it upright on the work bench.

Remove the fan and spacer from the input pulley (three cap screws).

Remove the pulley from the shaft (one snap ring).

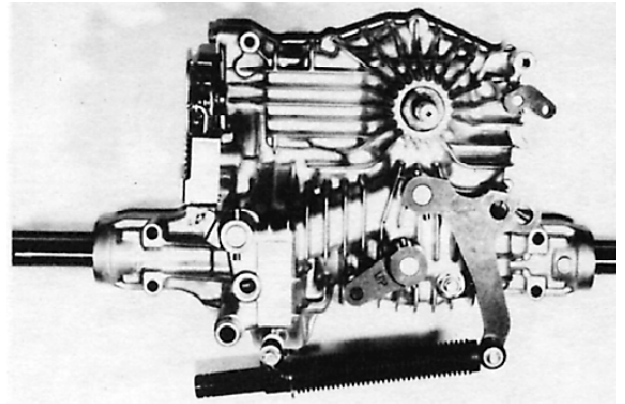


Figure 2

Transaxle Disassembly and Inspection

Begin disassembly and inspection of the transaxle by thoroughly cleaning the outside surface of the transmission.

IMPORTANT: Clean your work area thoroughly and cover the workbench with clean paper. This is extremely important as just one grain of sand can cause a hydrostatic transmission to fail.

Remove the drain bolt from the bottom center and drain the oil from the transaxle sump.

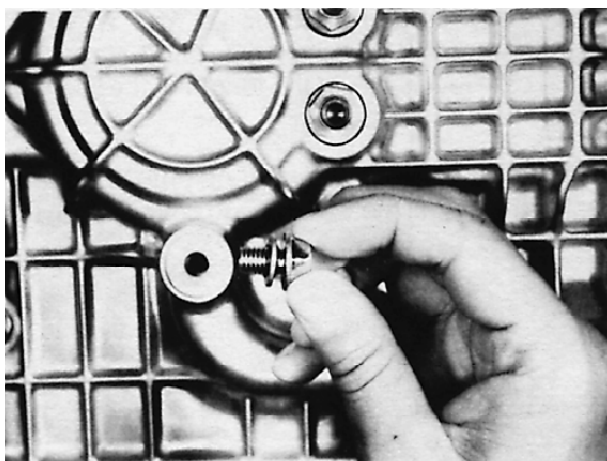


Figure 3

Remove the pressure fill plug and drain the oil from the rotating groups.

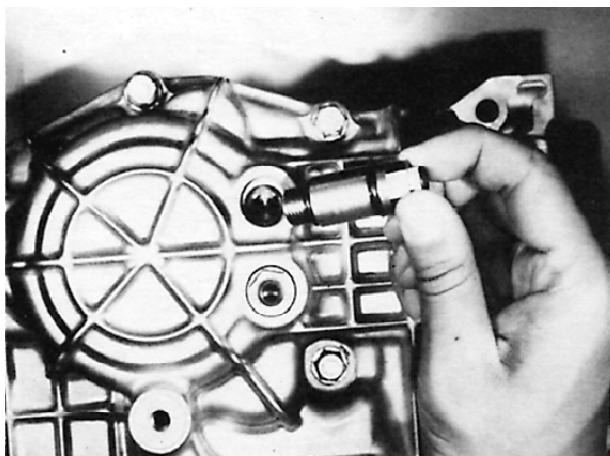


Figure 4

Remove the shock absorber by detaching the E clip, washer, and cotter pin and its washer. Later models use a spring clip retainer to secure the shock absorber.

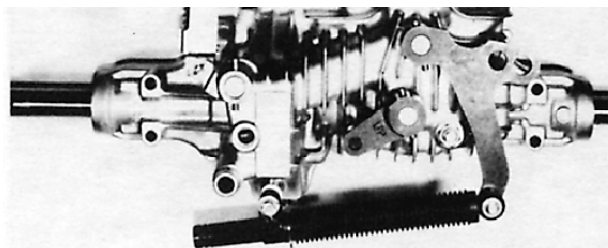


Figure 5

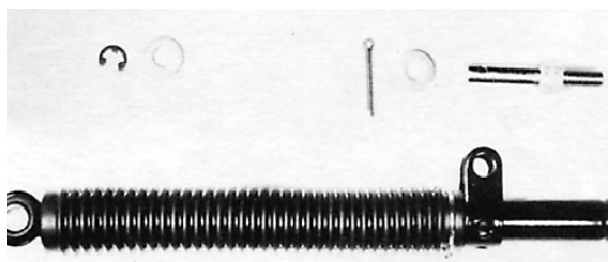


Figure 6

Remove the band brake assembly and brake rod component by taking out the cotter pin, washer, and three 12mm bolts. Replace the assembly if the friction material or actuating parts are worn or damaged.

Remove the ring and brake drum.

IMPORTANT: The brake drum and brake band must be free from oil or dust.

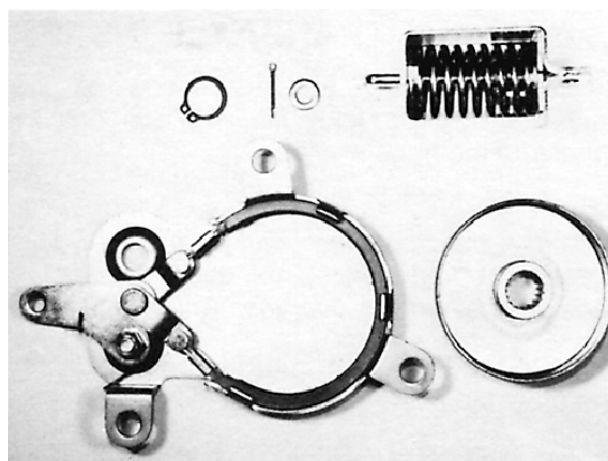


Figure 7

Open the transaxle case by taking out the 13 perimeter 12mm bolts and the single center bolt. Pry the bottom half of the case free from the top half, using care not to damage the seating surface.

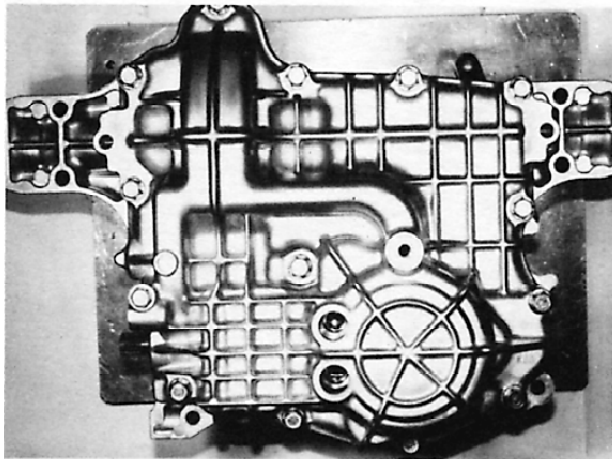


Figure 8

Lift the pinion shaft assembly from the upper case. There is a ball bearing on one end of the shaft and a bushing on the other end.

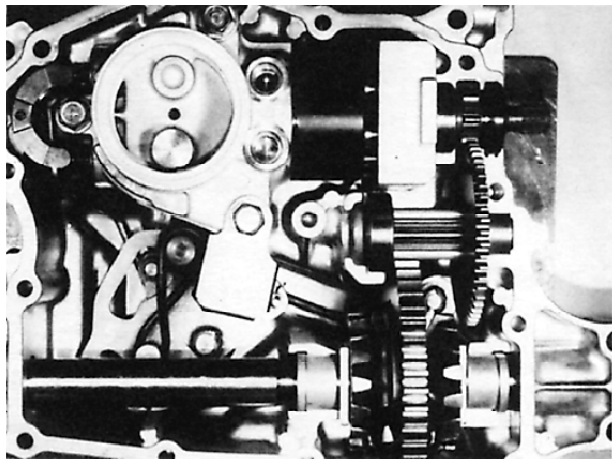


Figure 9

Remove the collar and ring from the left and right axle shaft.

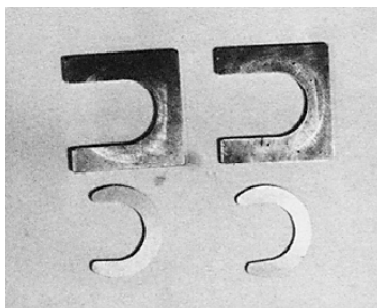


Figure 10

Remove the differential gear assembly.

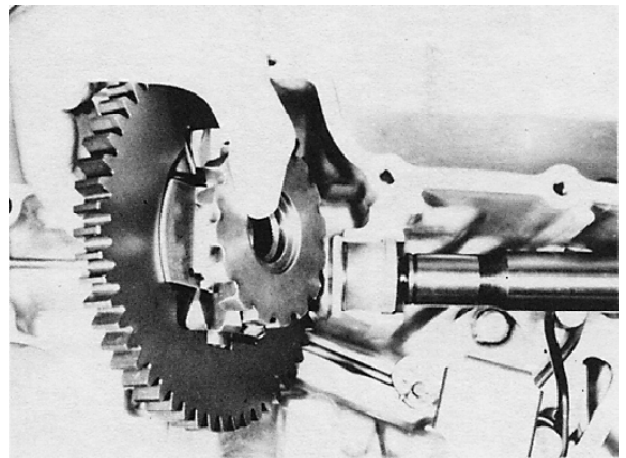


Figure 11

Remove the left and right axle shaft and two bushings from the upper case.

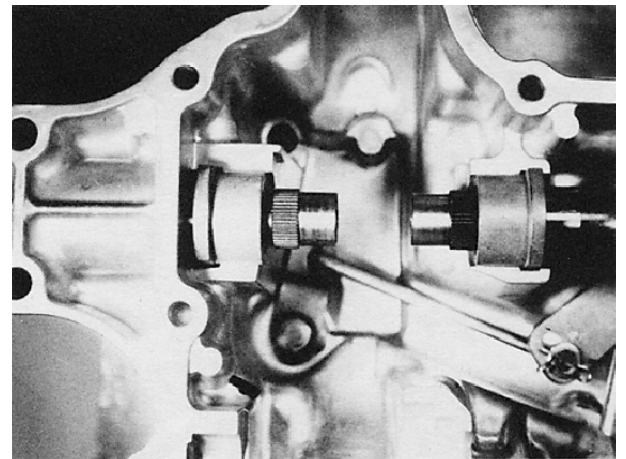


Figure 12

Remove the two seals from the upper case. Remove the axle bearings if replacing.

Inspect all parts for wear or damage and replace if necessary.

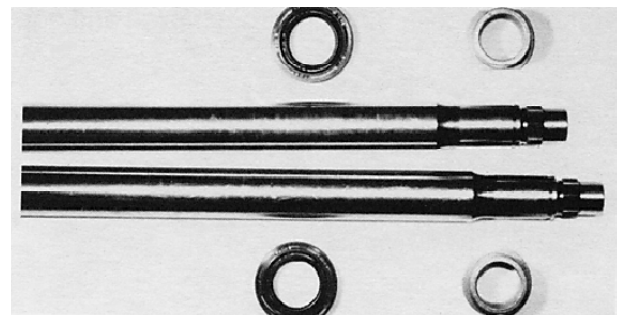


Figure 13

Measure the inside diameter of the bushings and the outside diameter of the left and right axle shaft.

Table 1

Measurement	Should be:
Bushings - Inside Diameter	22.06-22.15mm (.868-.872")
Axle Shaft Outside Diameter	21.98-22mm (.865-.866")
Clearance	0.08-0.17mm (.003-.006")
Maximum Wear Limit	0.5mm (.019")

Measure the inside diameter of the axle bores in the housing and the outside diameter of the left and right axle shaft.

Table 2

Measurement	Should be:
Housing Axle Bore – Inside Diameter	25.44-25.53mm (1.001-1.005")
Axle Shaft Outside Diameter	25.32-25.38mm (.996-.999")
Clearance	0.06-0.21mm (.002-.008")
Maximum Wear Limit	0.5mm (.019")

Take the filter out of the center case.

Note: Replace the filter whenever transaxle is disassembled for service.

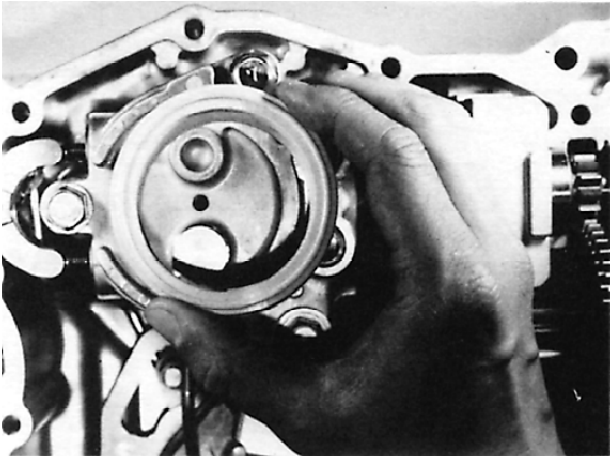


Figure 14

Disconnect the C arm from the push valve bypass shaft.

Remove the two push pins, springs, and valves from the center case.

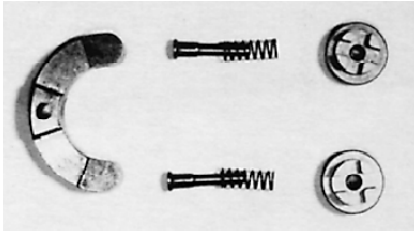


Figure 15

Remove sleeve A1, sleeve A2, the two backup rings, packings, balls, ball holders, springs, and bypass holders, using air pressure if necessary.

Note: Remove the two check valve assemblies only if necessary (leaking, sticking, or if extra-thorough cleaning is necessary). Air pressurization will remove one valve; the other can be pushed out from behind, after the center section is removed.

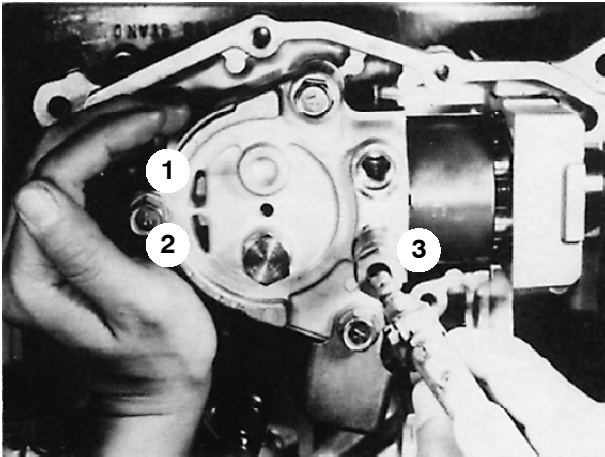


Figure 16

1. Valve A1

2. Valve A2
3. Pressurize with air to remove valves, if needed (pressure fill plug shown installed, with allen head plug removed).

Carefully inspect the packings (o-rings) to ensure they are not deformed, cut, or scratched. Use new packings on reassembly.

IMPORTANT: When removing the sleeves, note that their valves are different, and therefore not interchangeable. The A1 valve, located farthest from the axle, has a small hole in it, in addition to the large hole in the center. For reassembly purposes, mark the port from which this valve is removed.

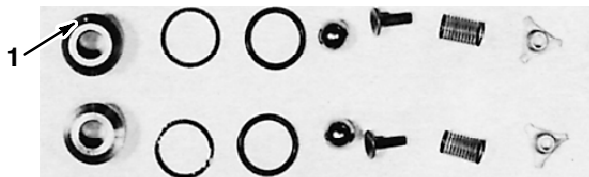


Figure 17

1. Note hole

Loosen the three bolts and remove the magnet from the center case. Clean the magnet thoroughly; use air pressure if necessary.

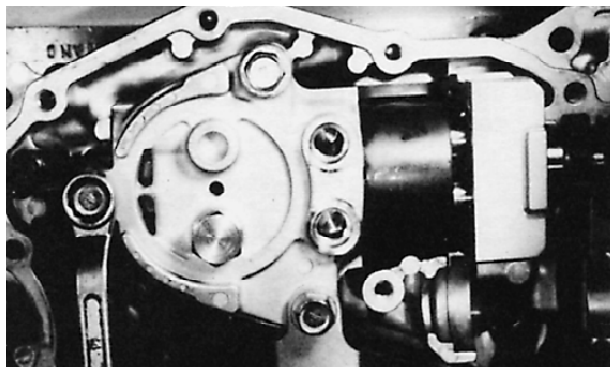


Figure 18

Make a mark on the top of the motor thrust bearing housing, for easy identification during reassembly.

Remove the motor shaft assembly, along with the center case assembly, from the upper case.

IMPORTANT: Pay close attention to the contact surfaces of the center case and cylinder blocks to prevent damage.

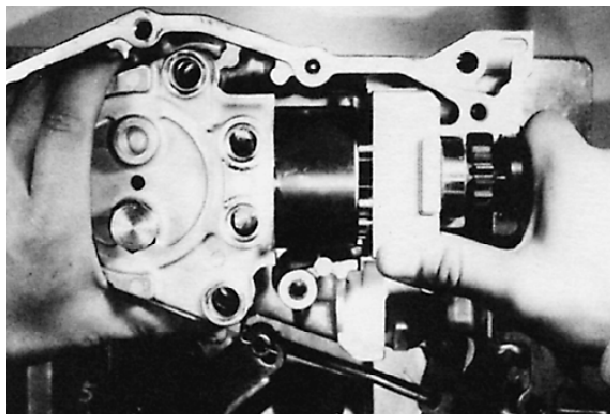


Figure 19

Remove the cylinder block from the pump shaft.

IMPORTANT: Be sure the pistons do not fall out of the block during removal.

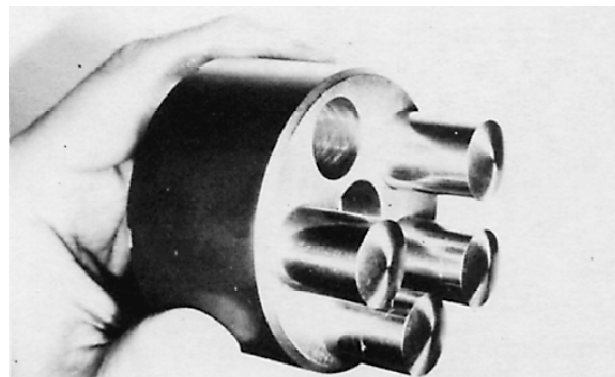


Figure 20

Inspect the five cylinder bores for burrs or scoring. The cylinder block and center section must be replaced if any scratch is deep enough to catch on a fingernail.

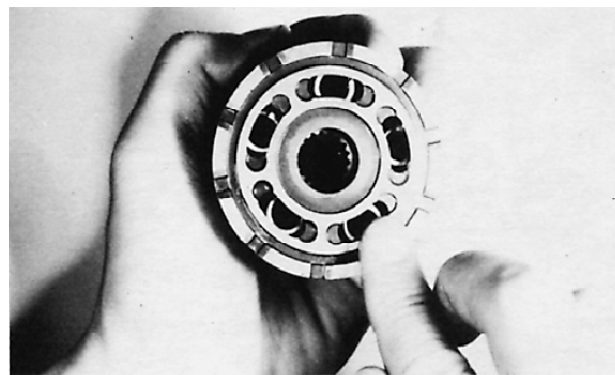


Figure 21

Inspect the five pistons and all parts of the cylinder block assembly for wear or damage.

Replace the center case and both cylinder block assemblies if any cylinder block assembly parts are damaged.

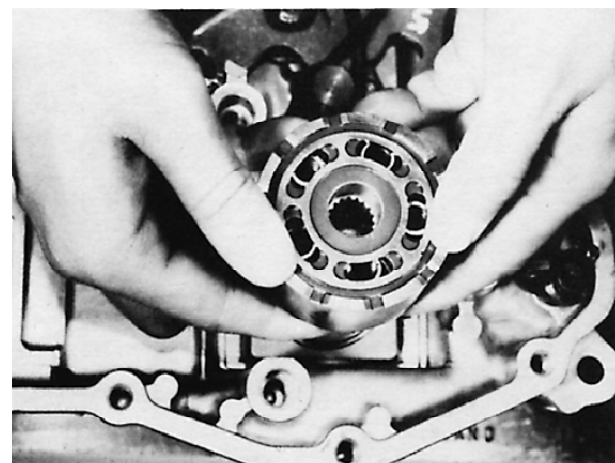


Figure 22

Measure the clearance between the swash plate and shift blocks.

Replace both shift blocks and the swash plate with new parts if they are beyond the maximum wear limit.

Table 3

Measurement	Should be:
Clearance	0.01-0.11mm (.0003-.004")
Maximum Wear Limit	0.15mm (.005")

Remove the spring and ring from the pump shaft.

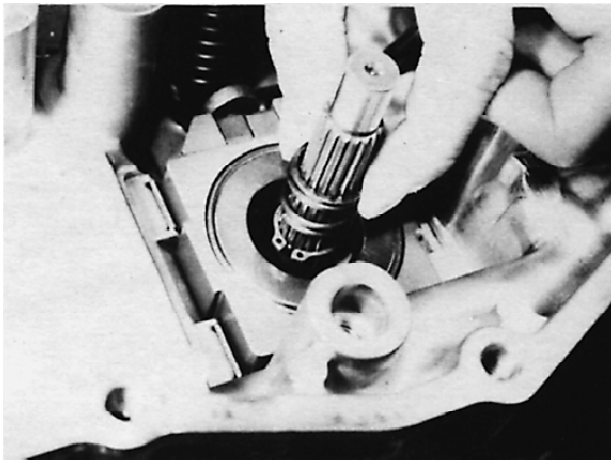


Figure 23

Remove the swash plate subassembly from the pump shaft.

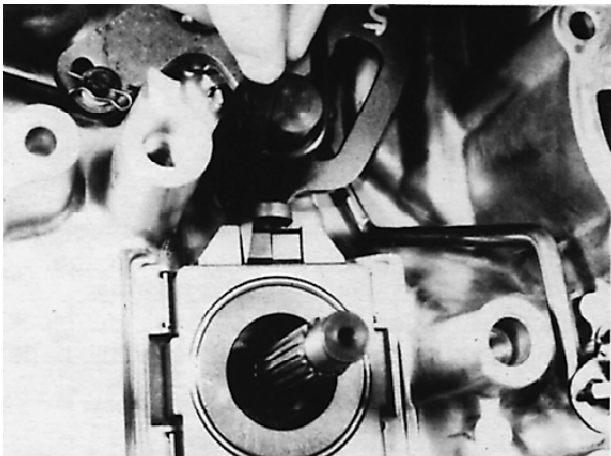


Figure 24

Inspect the swash plate, thrust bearing, thrust plates, and bushing for wear or damage. Replace with new parts if necessary.

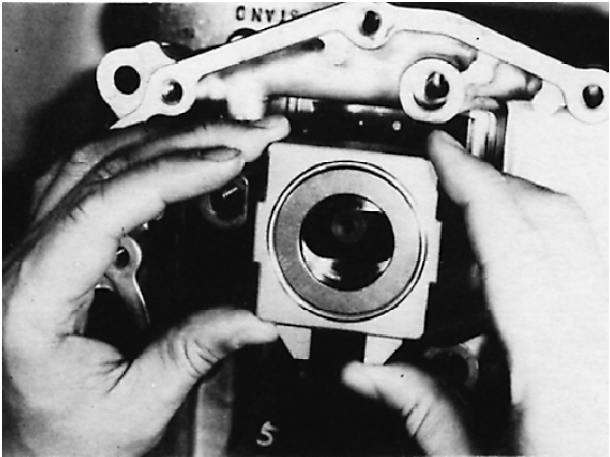


Figure 25

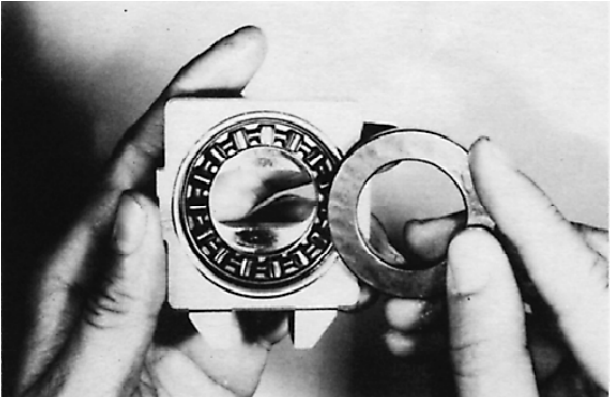


Figure 26

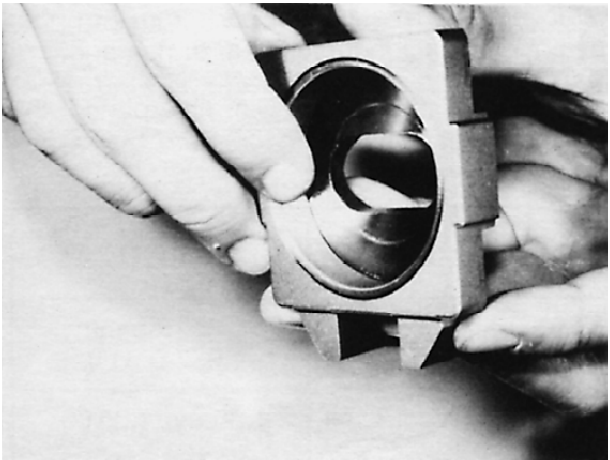


Figure 27

Remove the shift blocks from the control shaft and inspect them for wear or damage. Replace if necessary.

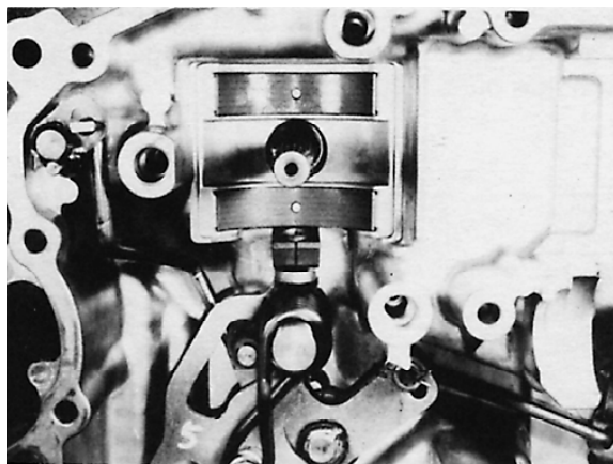


Figure 28

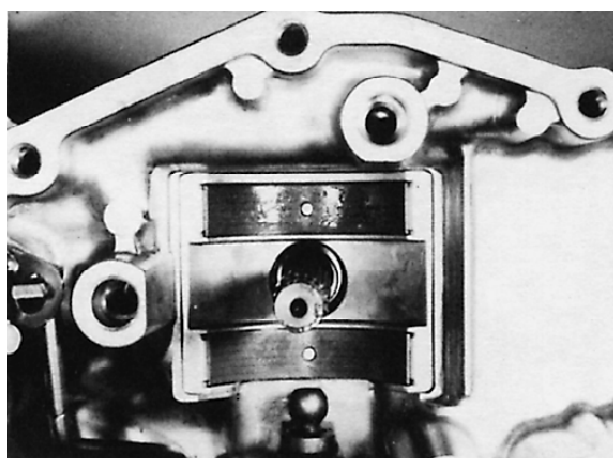


Figure 29

Remove the two metal thrust pads from the upper case and inspect them for wear or damage.

Replace both thrust pads with new parts if the maximum wear limit is exceeded.

Table 4

Measurement	Should be:
Thickness	1.45-1.55mm (.057-.061")
Maximum Wear Limit	1.30mm (.051")

Remove the input shaft, seal, and bearing from the upper case. Remove oil seal and large snap ring from the upper case. Remove the input shaft and bearing from the case.

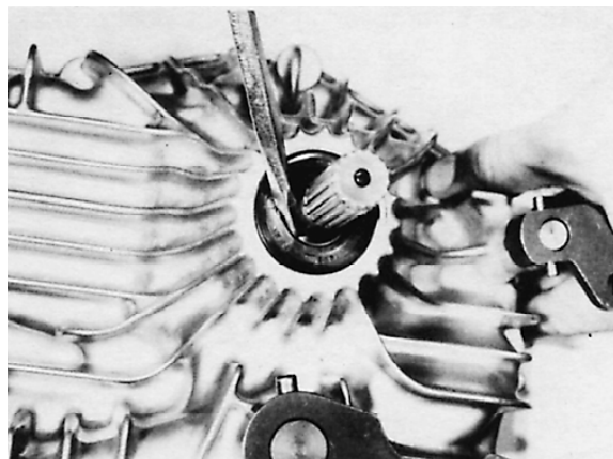


Figure 30

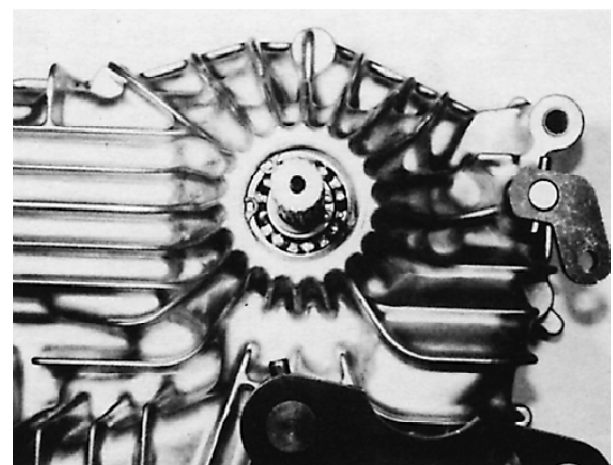


Figure 31

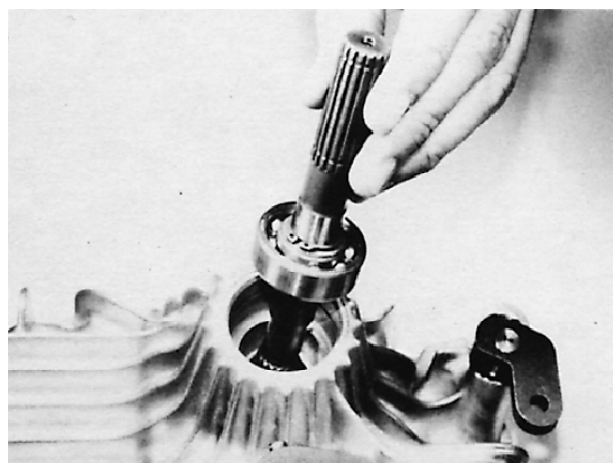


Figure 32

Note: If servicing a transaxle with low to moderate use, it is not necessary to disassemble or remove any of the levers or linkages from the upper case, unless a part is damaged or there is an oil leak. If doing a complete rebuild, all shafts should be removed, inspected, and packings (o-rings) replaced. If leaving the shafts in place, avoid excessive use of cleaning solvent on the upper case half, and do not use solvent that will damage the packings.

Detach the torsion spring from the control shaft.

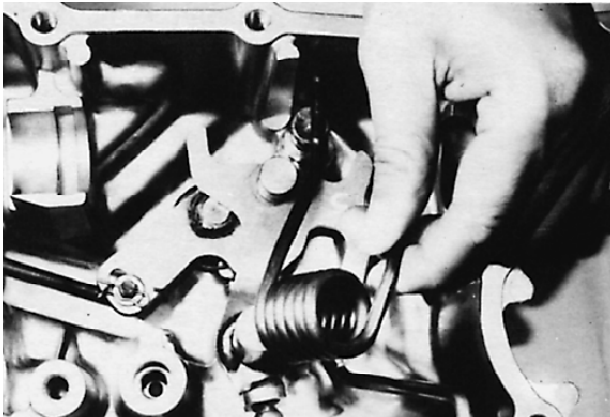


Figure 33

Remove the roll pin and lever from the control shaft subassembly and the lock nut from the neutral adjusting fulcrum.

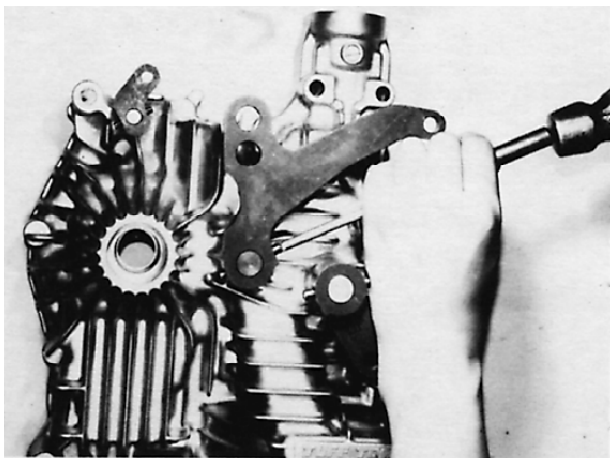


Figure 34

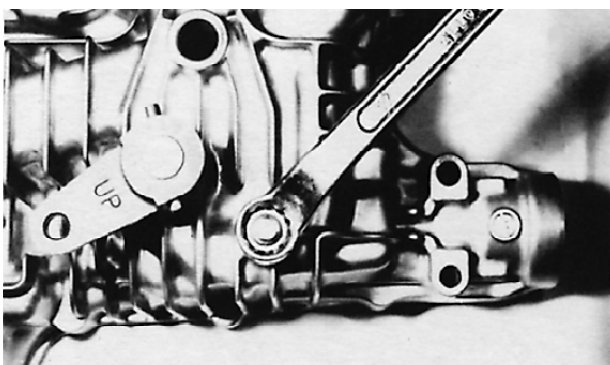


Figure 35

Inspect the control shaft, fulcrum, and torsion spring for wear or damage and replace if necessary.



Figure 36

Inspect the packings (o-rings) to ensure that they are not cut, scratched, or deformed.

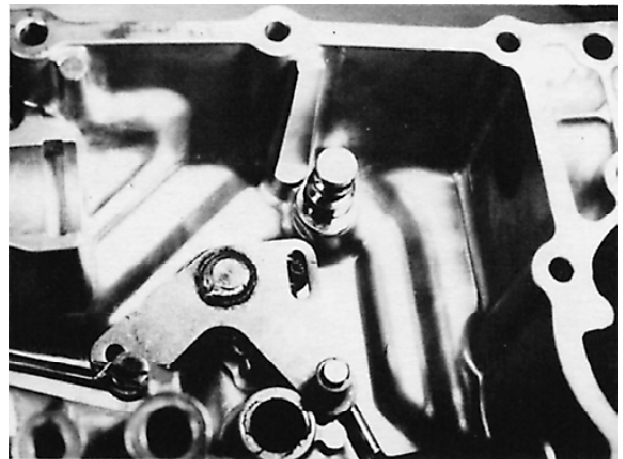


Figure 37

Drive the roll pin from the brake arm secured to the internal brake shaft.

Remove the brake arm from the brake shaft.

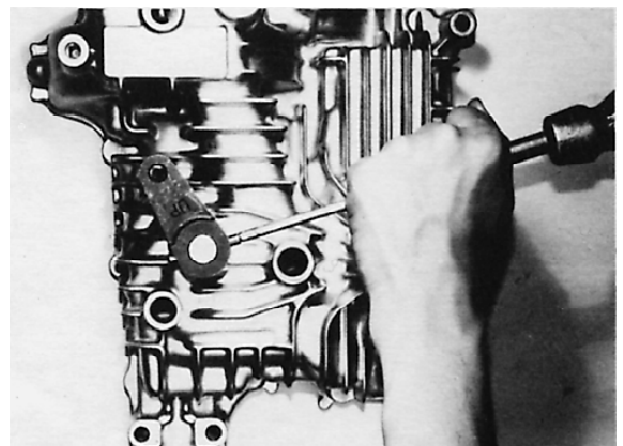


Figure 38

Drive the roll pin from the brake arm for the external band brake.

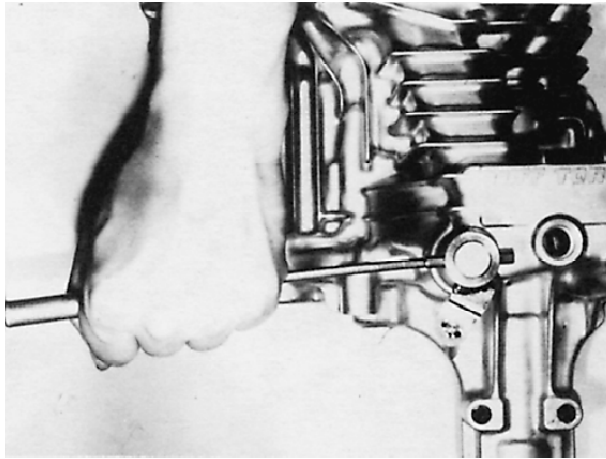


Figure 39

Remove the snap pin and washer from the brake rod.

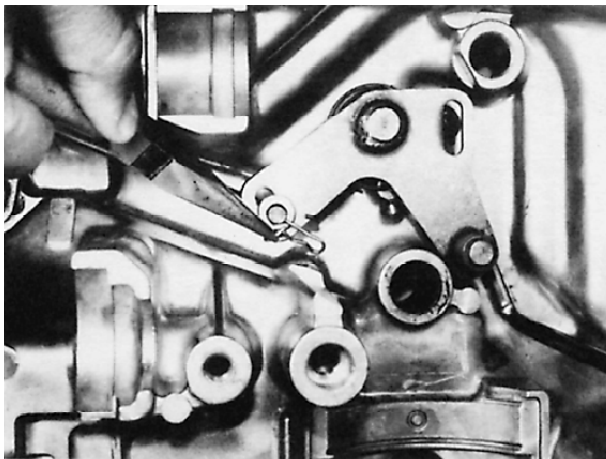


Figure 40

Remove the brake shaft from the upper case.
Inspect the packing (o-ring) for cuts, scratches, or deformation.

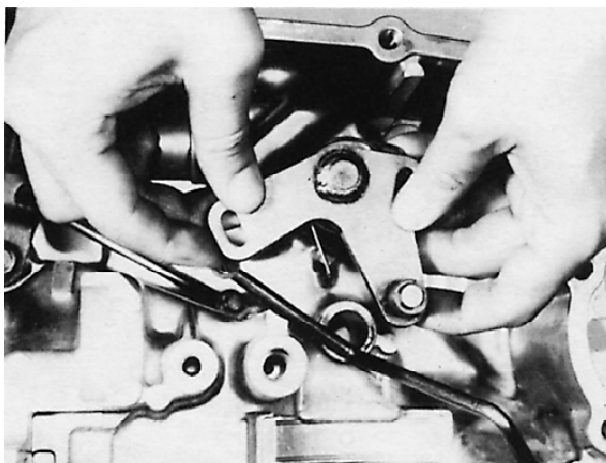


Figure 41

Remove the brake rod and brake arm from the upper case.

Inspect the packing for cuts, scratches, or deformation.

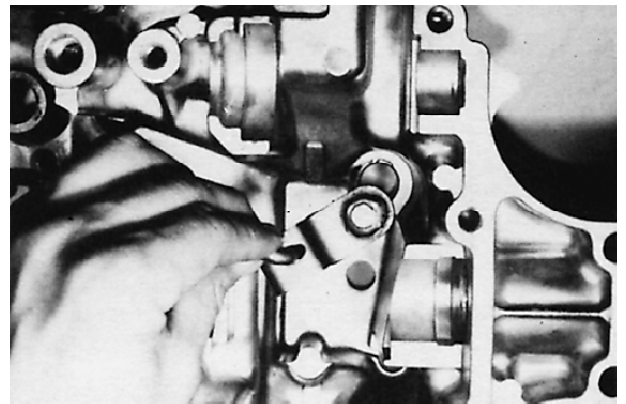


Figure 42

Remove the roll pin from the push valve bypass release arm.

Disconnect the push valve bypass release arm from the bypass shaft.

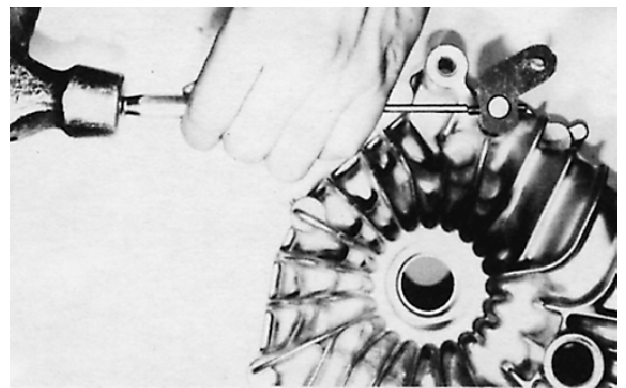


Figure 43

Remove the bypass shaft subassembly, spring, and bypass rod.

Inspect the packing (o-ring) for cuts, scratches, or deformation.

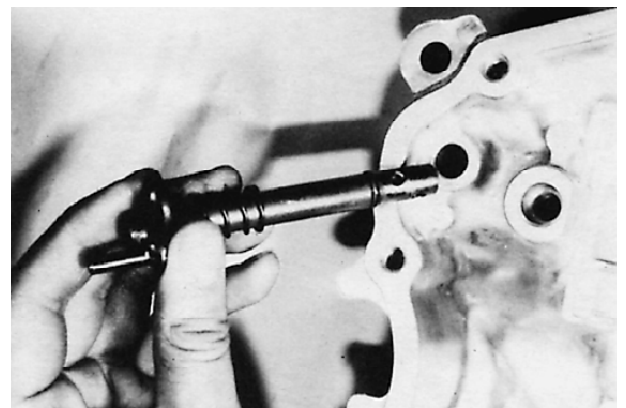


Figure 44

Pinion

Remove the bearing, bushing, washer, and shaft gear from the pinion shaft.

Inspect all parts for wear or damage. Replace if necessary.

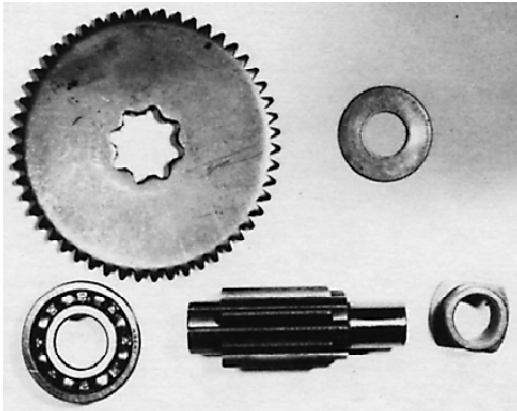


Figure 45

Measure the inside diameter of the bushing and the outside diameter of the pinion shaft.

Table 5

Measurement	Should be:
Bushings – Inside Diameter	15.05-15.13mm (.592-.595")
Pinion Shaft – Outside Diameter	14.97-14.99mm (.589-.590")
Clearance	0.06-0.16mm (.002-.006")
Maximum Wear Limit	0.5mm (.019")

Differential Gear

Remove the differential side gears, thrust washers, differential pinion gears, and differential pinion shaft from the final gear.

Inspect all parts for wear or damage. Replace if necessary.

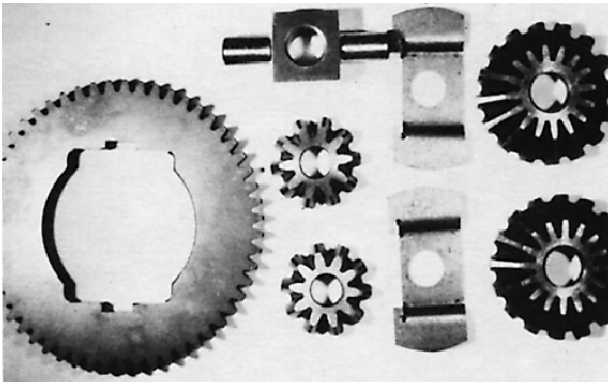


Figure 46

Measure the inside diameter of the differential pinion gears and the outside diameter of the differential pinion shaft.

Table 6

Measurement	Should be:
Differential Pinion Gears – Inside Diameter	15.05-15.06mm (.592-.593")
Differential Pinion Shaft – Outside Diameter	14.96-14.98mm (.589-.590")
Clearance	0.05-0.10mm (.019-.003")
Maximum Wear Limit	0.5mm (.019")

Center Case

Take out the two knock pins, plug, and packing (o-ring) (early models), if required. If the shaft bushings require replacement, remove them.

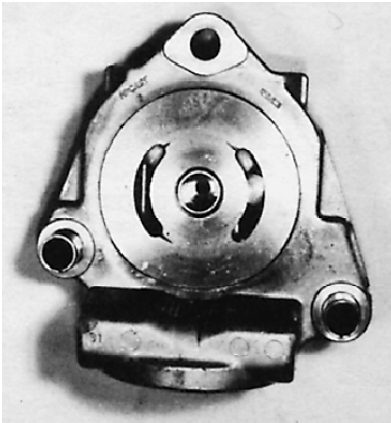


Figure 47

Inspect the center case by running your fingernail over its surface. Replace the center case and cylinder blocks if fingernail catches on scratches.

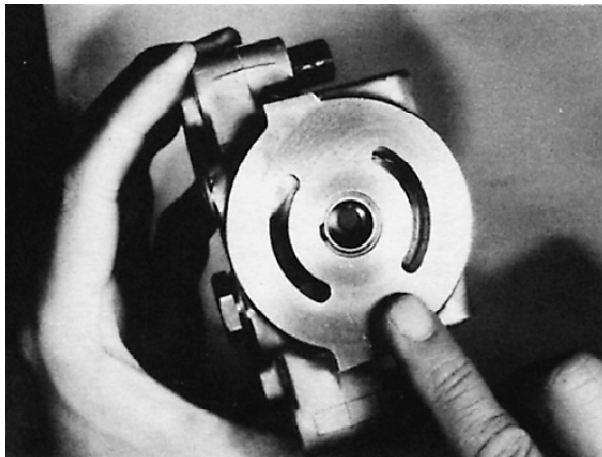


Figure 48

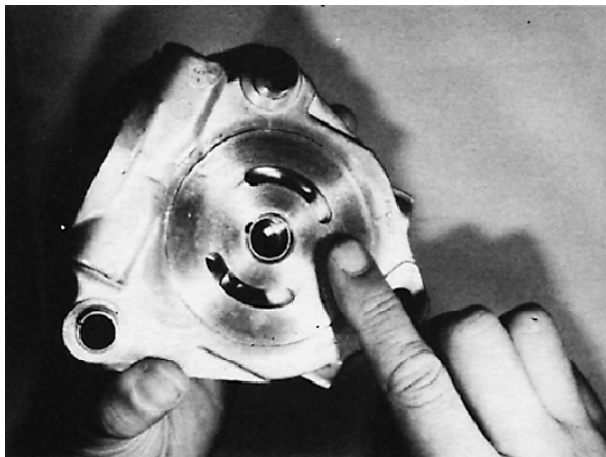


Figure 49

Motor Shaft

Remove the cylinder block assembly from the motor shaft.

Inspect the five cylinder bores for burrs or scoring.

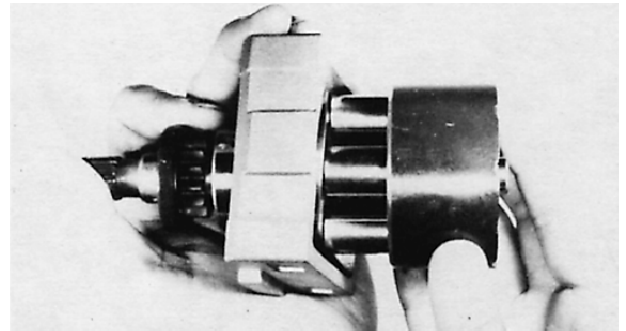


Figure 50

Inspect the five pistons and all parts of the cylinder block assembly for wear or damage.

Replace the center case and both cylinder block assemblies if any cylinder block assembly parts are damaged.

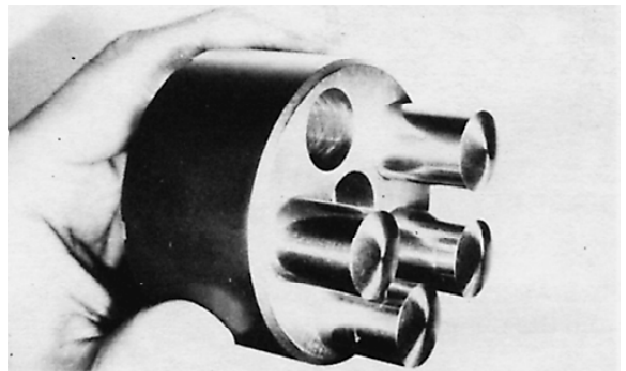


Figure 51

Remove the spring and snap ring from the motor shaft.

Remove the thrust bearing and housing from the motor shaft and inspect them for wear or damage. Replace if necessary.

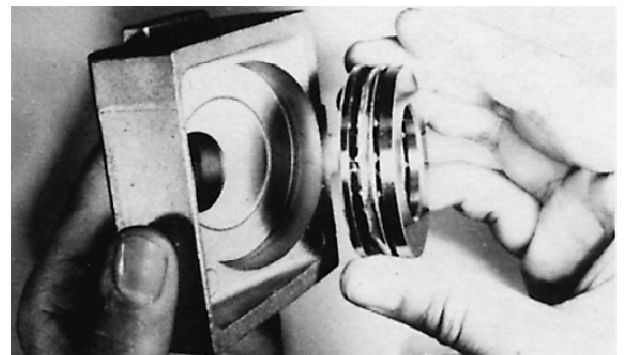


Figure 52

Remove the snap rings, washer, bearing, and seal from the motor shaft (brake shaft).

Note: Do not remove the bearing unless it needs to be replaced. It is a press fit and will likely be damaged in the process of removing it.

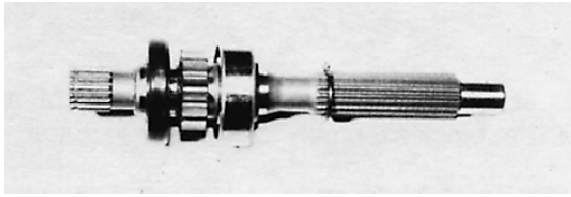


Figure 53

Inspect the motor shaft and bearing for wear or damage and replace if necessary.

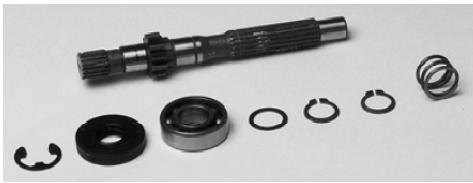


Figure 54

Pump Shaft

Remove the two snap rings, washer, and bearing from the pump shaft.

Note: Do not remove the bearing unless it needs to be replaced. It is a press fit and will likely be damaged in the process of removing it.

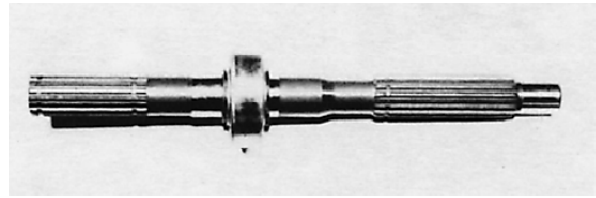


Figure 55

Inspect the bearing and pump shaft for wear or damage and replace if necessary.

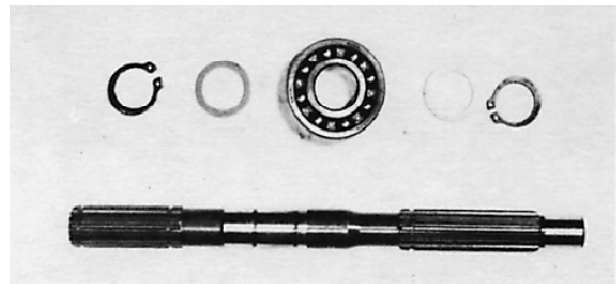


Figure 56

Transaxle Assembly and Adjustment

IMPORTANT: A clean working environment is essential during assembly of the transaxle. Otherwise, your rebuild efforts may not be successful.

Clean all parts thoroughly prior to assembly. Do not reuse o-rings or seals; replace with new parts.

Bypass Return

Place the new packing (o-ring) and spring on the bypass shaft.

Note: Apply grease to packing before installation.

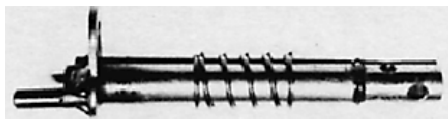


Figure 57

Attach the bypass shaft to the upper case.



Figure 58

Place the push valve release arm on the bypass shaft.

Drive the roll pin through the arm and shaft.

Install the bypass rod on the bypass shaft.

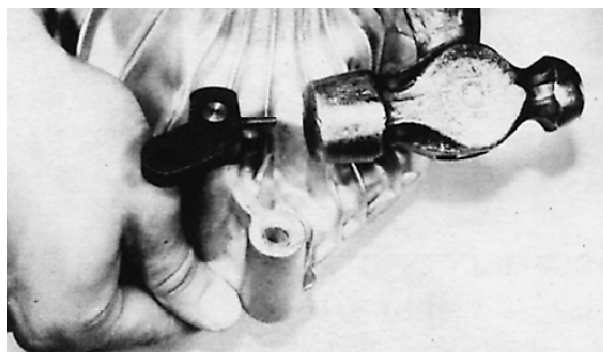


Figure 59

Brake Interlock

Place the new packing (o-ring) and brake rod on brake arm.

Note: Apply grease to packing before installation.

Apply a light film of grease into the hole of the upper case, then insert the brake arm into the upper case.

Install the bushing, E-ring, and new packing (o-ring) on the brake shaft.

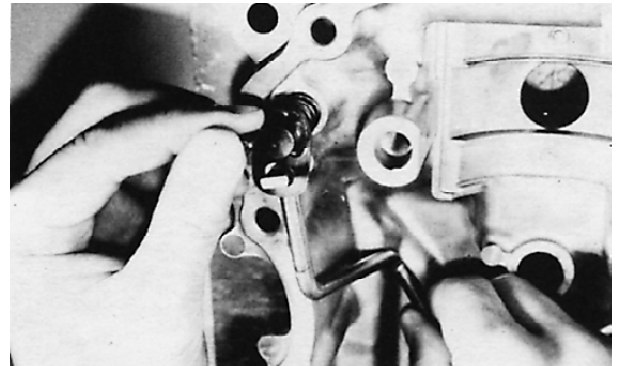


Figure 60

Place the spring on the brake shaft.

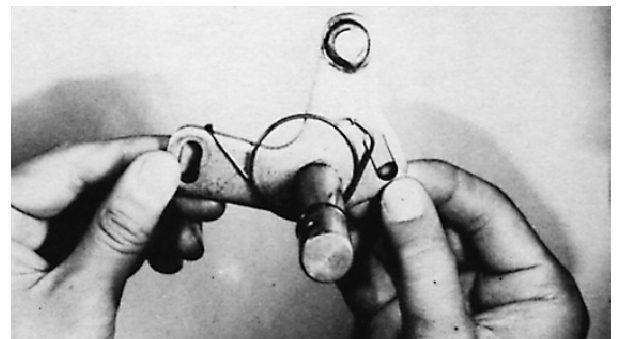


Figure 61

Apply a light film of grease into the hole in the upper case, then insert the brake shaft in the upper case, hook the spring to the housing, and connect the bypass valve rod to the brake shaft.

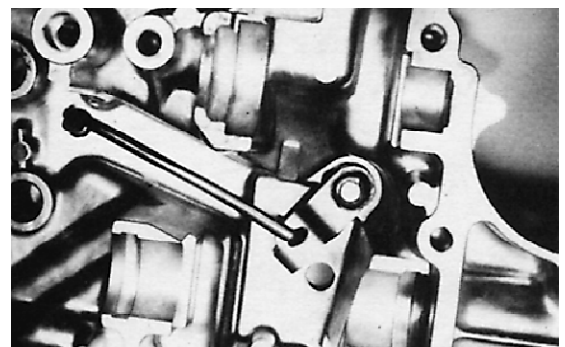


Figure 62

Connect the brake rod to the brake shaft. Place the washer on the brake rod and then attach the snap pin to the brake rod.

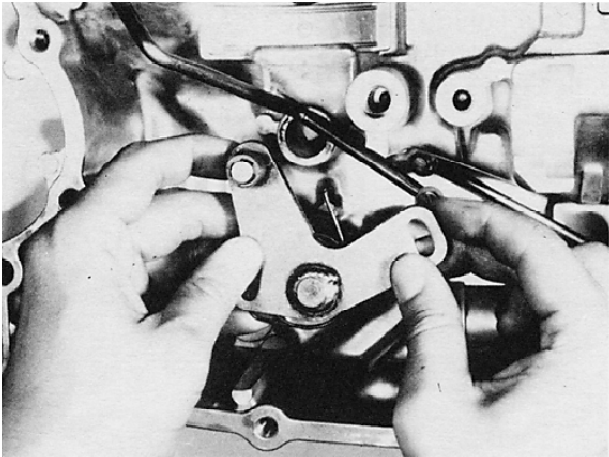


Figure 63

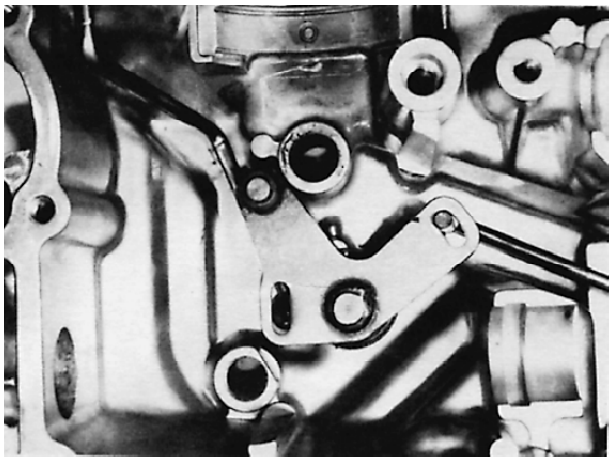


Figure 64

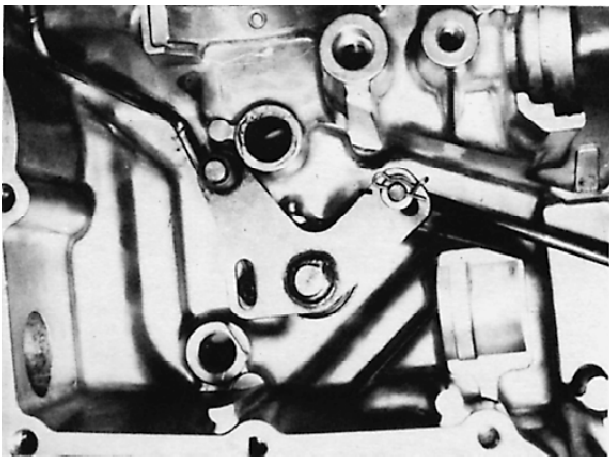


Figure 65

Install the brake arm on the brake shaft. Make sure the word "UP" on the brake arm is visible.

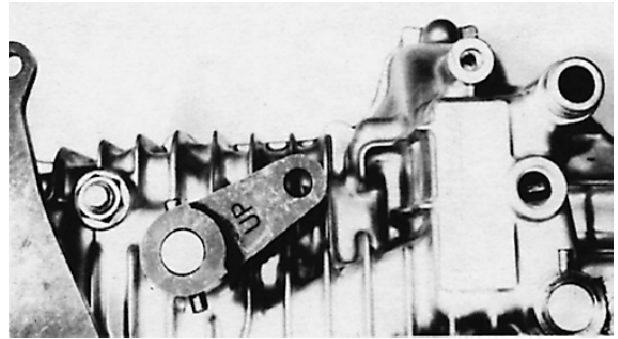


Figure 66

Drive the roll pin through the brake arm and brake shaft.

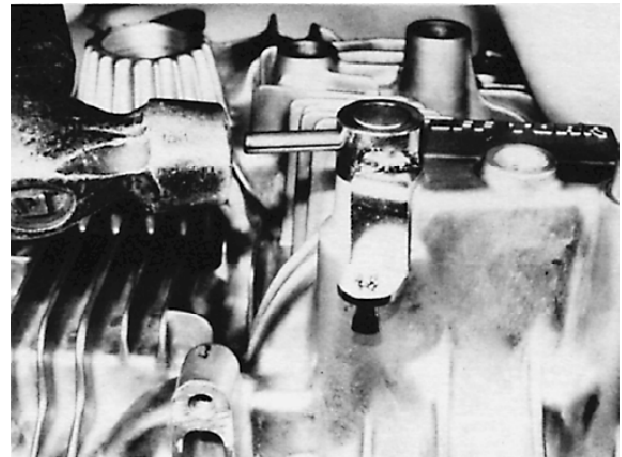


Figure 67

Neutral Adjust Eccentric

Place new packing (o-ring) on the neutral adjust eccentric.

Note: Apply grease to packing before installation.

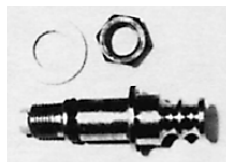


Figure 68

Apply a light film of grease into the hole on the upper case and insert the neutral adjust eccentric into the upper case.

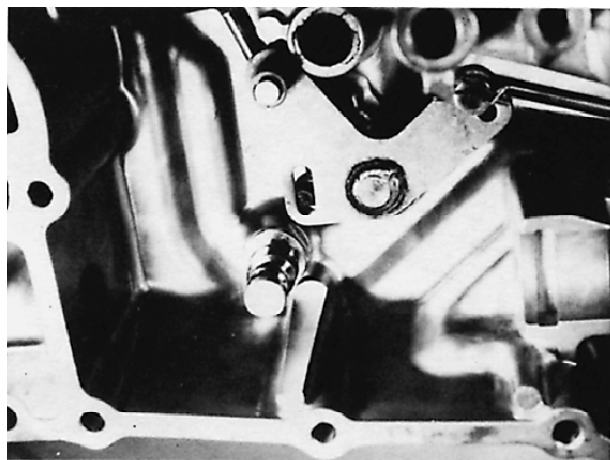


Figure 69

Place new packing (o-ring) and torsion spring on the control shaft.

Note: Apply grease to packing before installation.

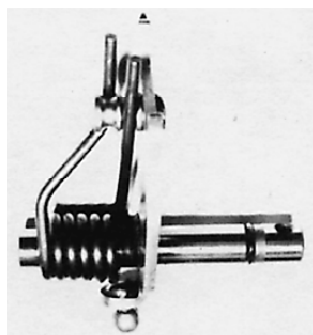


Figure 70

Install the control shaft in the upper case and position the torsion spring as shown.

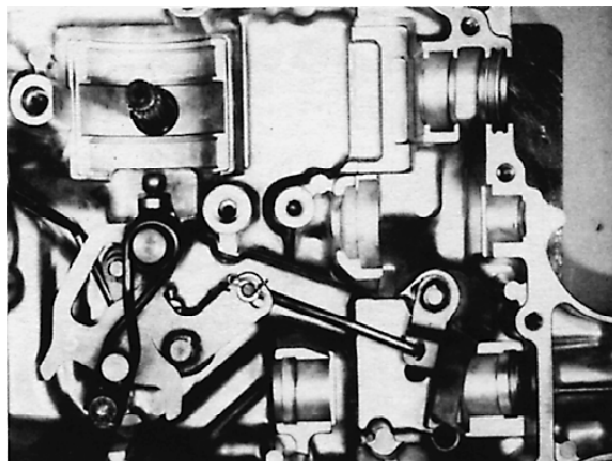


Figure 71

Drive the roll pin through the hydrostatic control arm and control shaft.

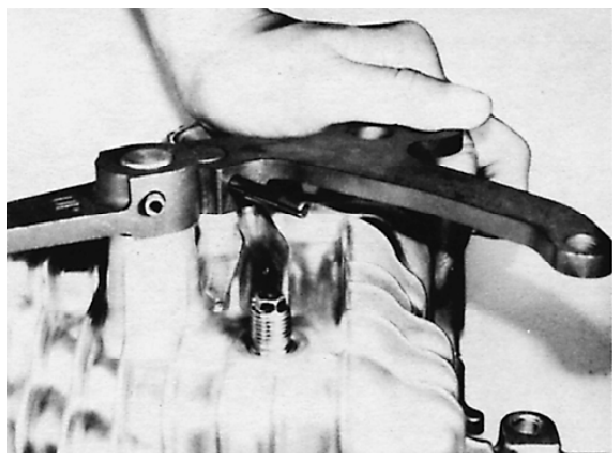


Figure 72

Install the washer and nut on the neutral adjust eccentric.

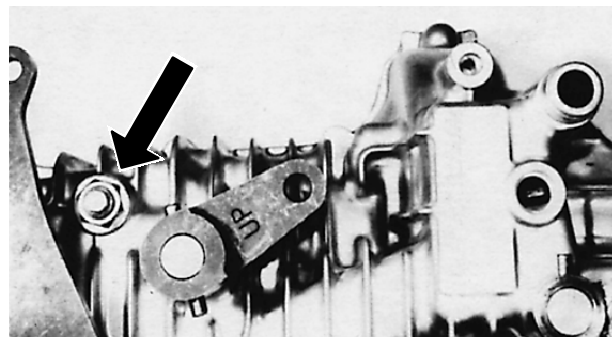


Figure 73

Pump Shaft

Install the bearing on the pump shaft.

Install two washers and two snap rings on the pump shaft.

Note: Make sure the snap rings are seated correctly in the pump shaft grooves.

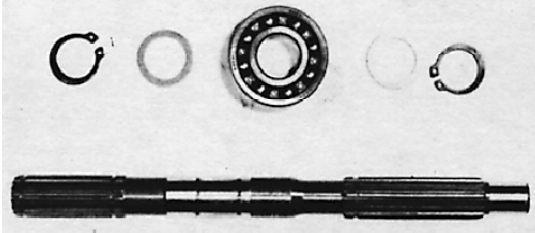


Figure 74

Insert the pump shaft into the upper case.

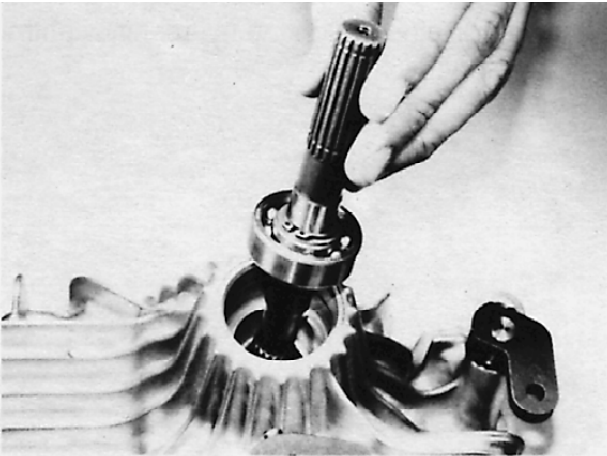


Figure 75

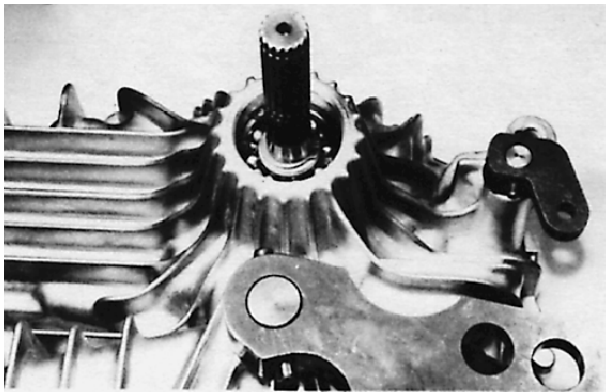


Figure 76

Install the snap ring and the new seal onto the pump shaft.

Note: Apply grease to the lip of the seal and place tape on the spline of the pump shaft to keep the seal lip from becoming damaged during installation.

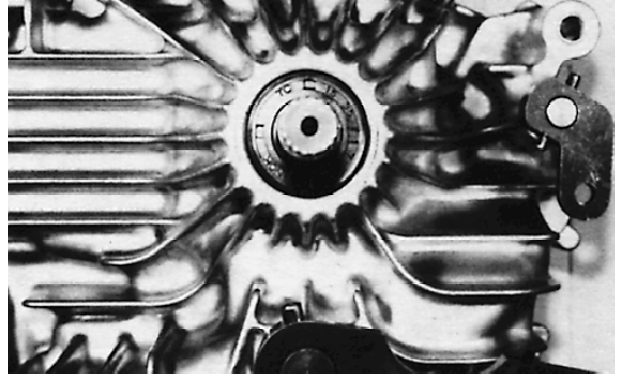


Figure 77

Swash Plate

Insert the two metal thrust pads into the upper case. Apply oil to the pads.

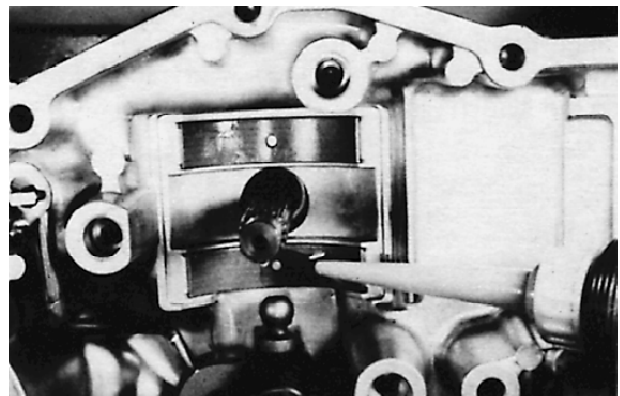


Figure 78

Apply grease to the inside of the shift blocks to hold them in place and install the shift blocks on the control shaft.

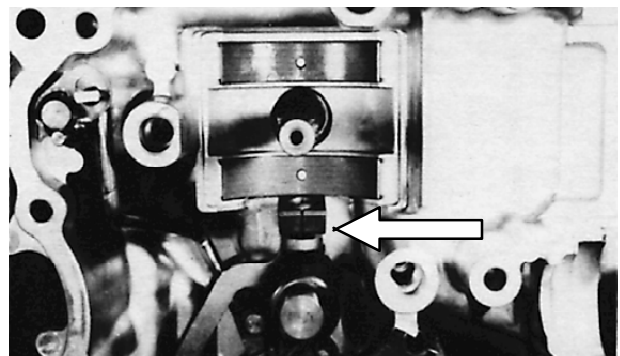


Figure 79

Assemble thin thrust plate, thrust bearing, and thick thrust plate to the swash plate.

Note: Apply new oil to all parts prior to installation.

Note: Be sure to place the thinner thrust plate at the bottom of the swash plate.

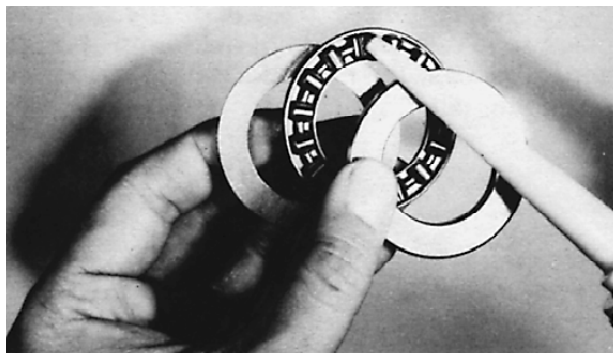


Figure 80

Place the swash plate on the pump shaft. The shift blocks should be facing toward the slit found on the swash plate.

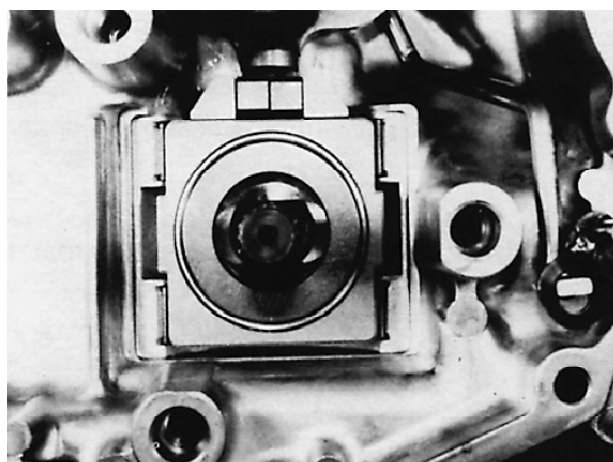


Figure 81

Table 7

Measurement	Should be:
Clearance Between Swash Plate and Shift Blocks	0.01–0.11mm (.0003-.004")

Pump Cylinder Block

Place the snap ring and spring on the pump shaft.

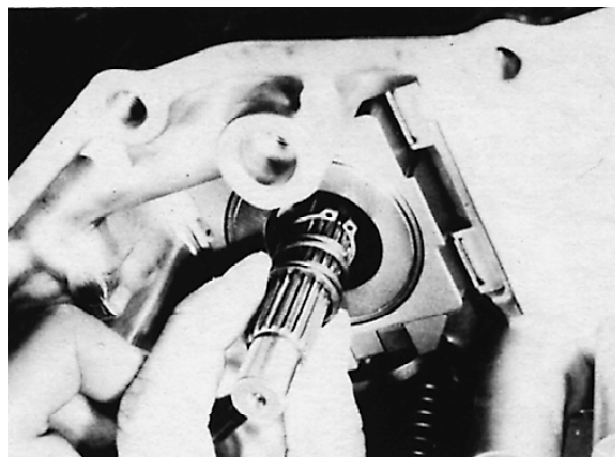


Figure 82

Insert a backup washer and spring into each piston, and install the pistons in the cylinder block holes.

Note: All parts should be cleaned, and new oil applied to them, before assembly.

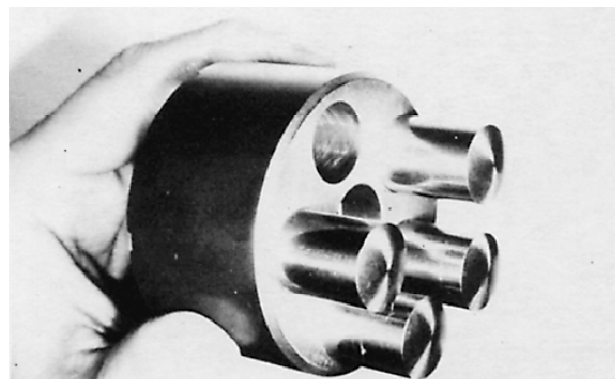


Figure 83



Figure 84

Install the cylinder block subassembly on the pump shaft.

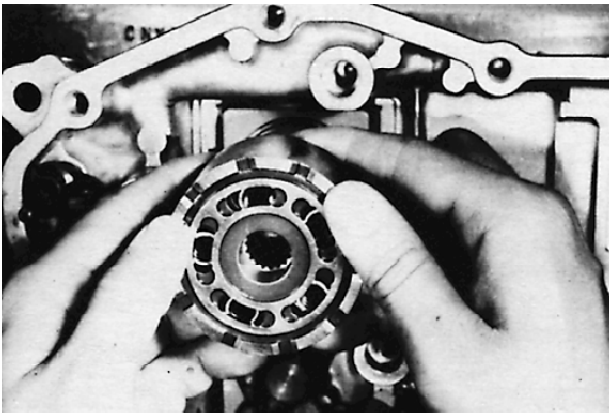


Figure 85

Motor Shaft

Install the bearing, washer, and two snap rings on the motor shaft.

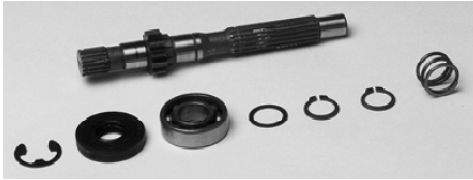


Figure 86

Attach the new seal to the motor shaft.

Note: Apply grease to the lip of the seal and place tape on the spline of the motor shaft to keep the seal lip from becoming damaged during installation.

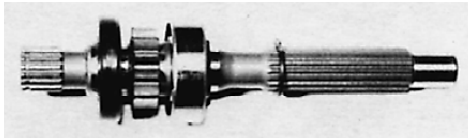


Figure 87

Apply new oil to the thrust bearing and install the thrust bearing on the housing.



Figure 88

Note: Be sure to place the bearing retainer, which has the larger inner diameter, at the bottom of the housing.

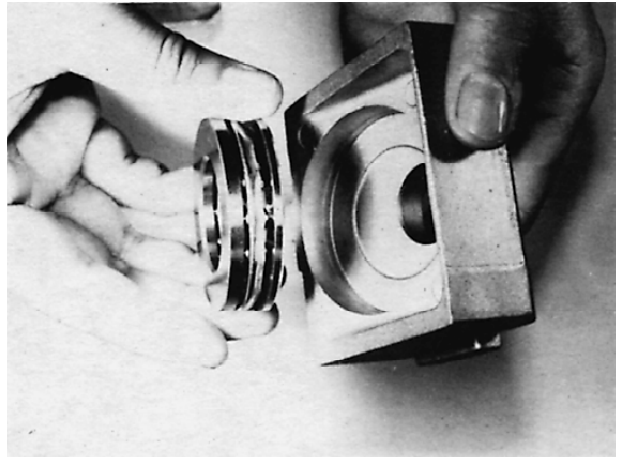
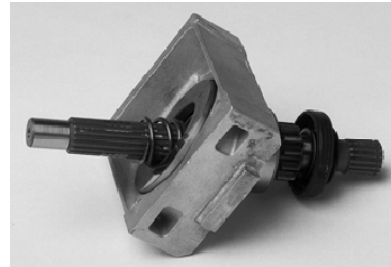


Figure 89

Assemble the housing to the motor shaft. Install snap ring and spring on the motor shaft.



Center Case

Install the two knock pins and shaft bushings in the center case, if removed.

Note: When installing the bushings, make sure they are seated correctly in the center case.

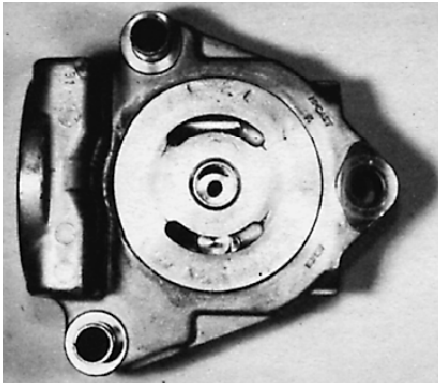


Figure 92

Install the two retainers, springs, ball holders, balls, new packings (o-rings), backup rings, as well as sleeve A1 and sleeve A2 into the center case.

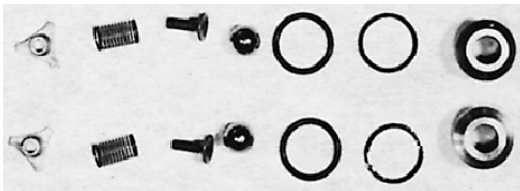


Figure 93

IMPORTANT: Remember, sleeve A1 and sleeve A2 have different valves. The A1 valve has a small hole in it, in addition to the large hole in the center, and must be installed in the port located farthest from the axle.

Note: Apply grease to the packings prior to installation.

To reassemble, place each part in the bore one at a time, using tweezers or similar tool. Carefully press or tap each sleeve into its final position.

Check ball movement after assembly.

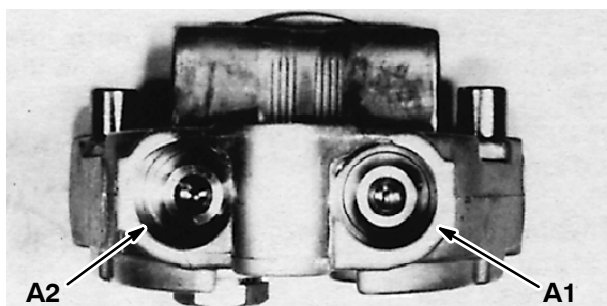


Figure 94

Motor Shaft and Center Case Installation

Oil contact surfaces of center case and cylinder blocks.

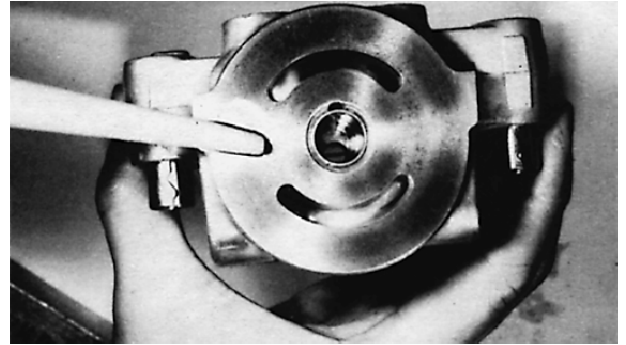


Figure 95

Note: Be careful that no damage occurs to the center case surface during reassembly.

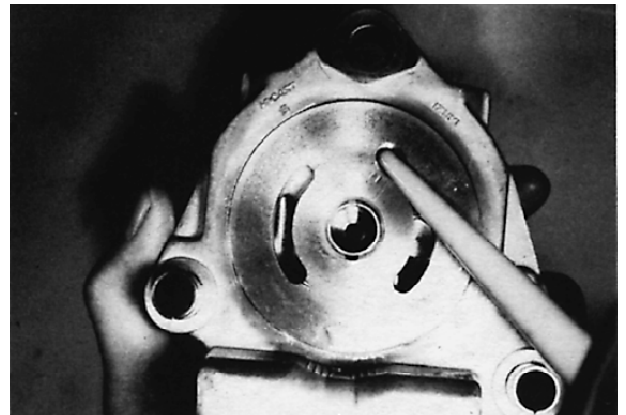


Figure 96

Install the motor shaft subassembly and center case subassembly in the case at the same time.

Note: The motor housing is installed so the pistons are “in” at the top and “out” at the bottom. Make sure the pump cylinder block splines are aligned with the pump shaft. Compress the motor pistons into the cylinder block while aligning the center case with the mounting holes. Slowly work the parts into final position, making sure the pump shaft engages with the cylinder block, the motor housing and shaft bearing/seal go straight down into their notches in the upper case, and the motor thrust bearing stays in the correct position.

Note: Assemble and handle components with care so that no damage occurs to center case surfaces.

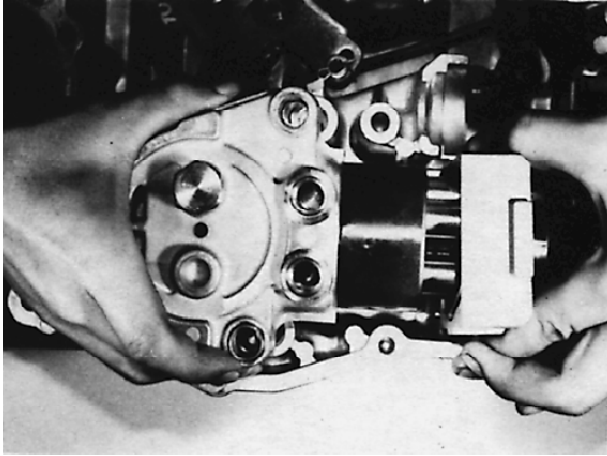


Figure 97

Secure the three bolts and magnet to the upper case. Tighten using a torque of 32 ft. lbs. - 46 ft. lbs. (4.5N·m - 6.5N·m).

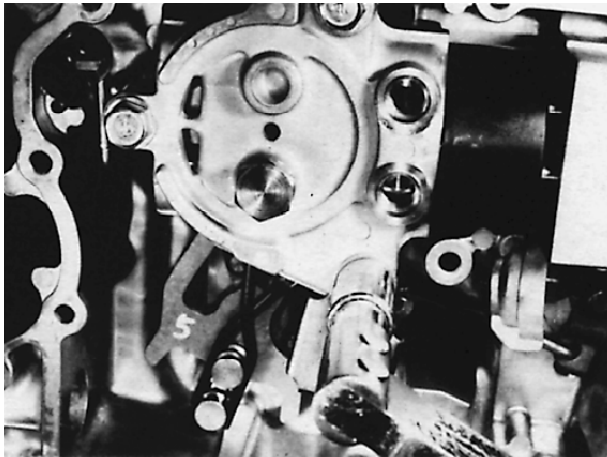


Figure 98

Attach the two bypass actuating valves, springs, and push pins to the center case. Check push pin movement after assembly.

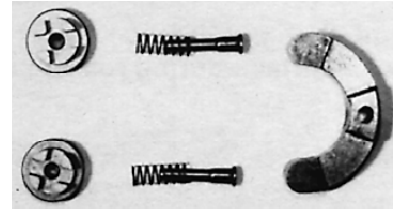


Figure 99

Attach the C arm to the bypass shaft.

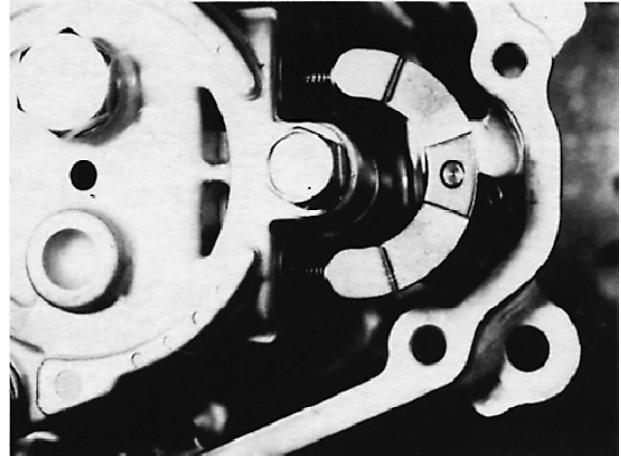


Figure 100

Place a new filter on the center case groove.

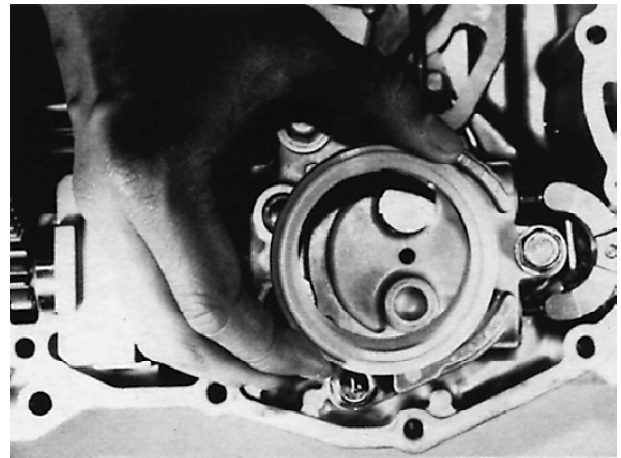


Figure 101

Differential Gear

Attach the two differential pinions to the differential pinion shaft.

Connect the differential pinion shaft to the final gear.

Place the two thrust washers on the final gear.

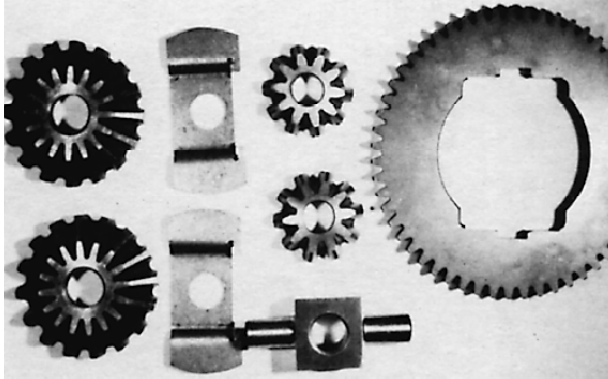


Figure 102

Attach the two differential side gears to the final gear.

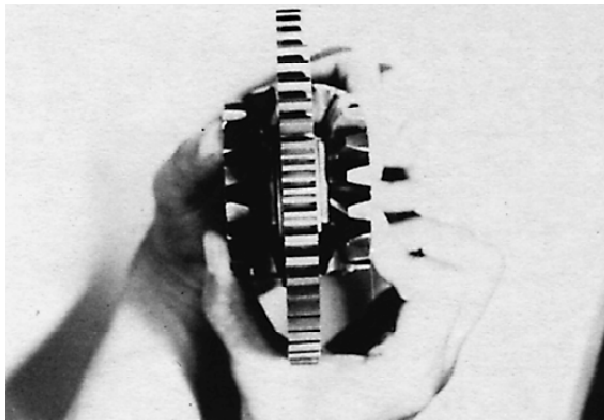


Figure 103

Axle Shafts and Differential Installation

Install new seal on the left and right axle shaft.

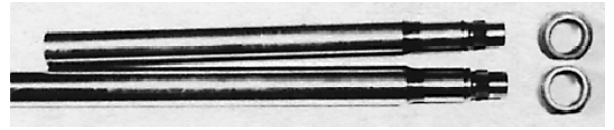


Figure 104

Note: Apply grease to the lip of each seal before installing and use tape on axle to protect seal from damage during installation.

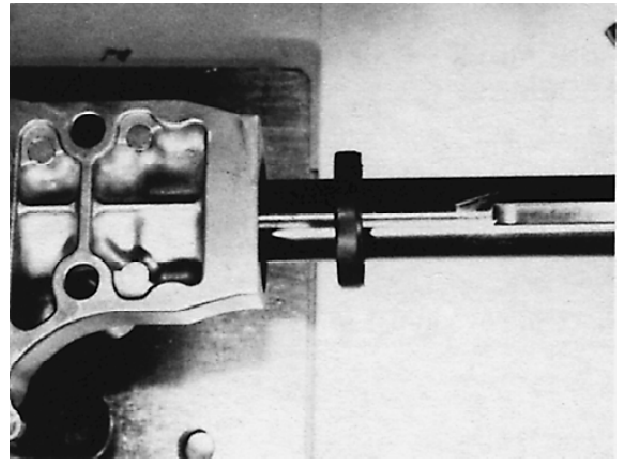


Figure 105

Install the left and right axle shaft and two bushings in the upper case.

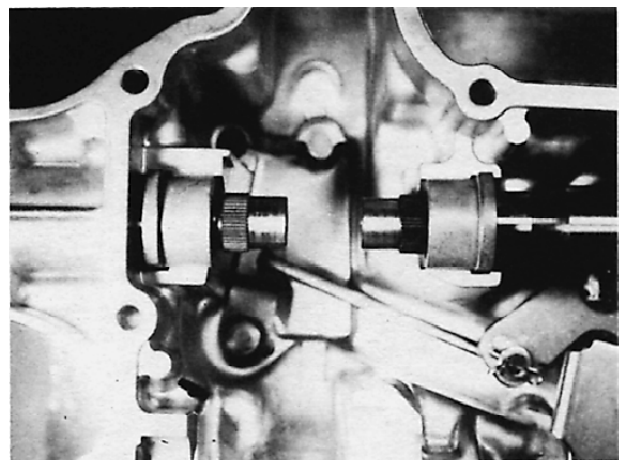


Figure 106

Connect the differential gear assembly to the left and right axle shaft.

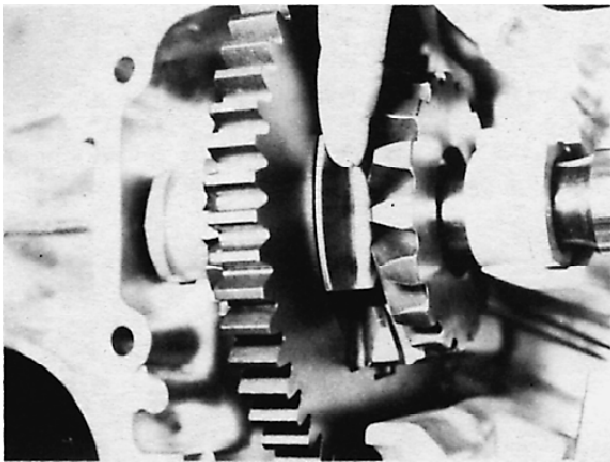


Figure 107

Install a retaining ring on the left and right axle shaft.

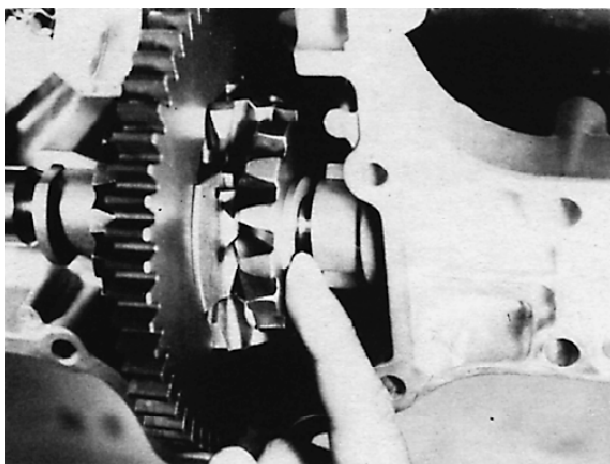


Figure 108

Install a collar on the left and right axle shaft.

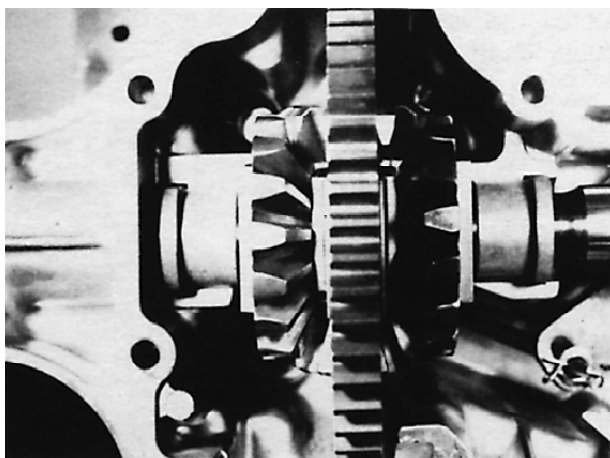


Figure 109

Pinion

Secure the bearing to the pinion shaft.

Attach the shaft gear, washer, and bushing to pinion shaft.

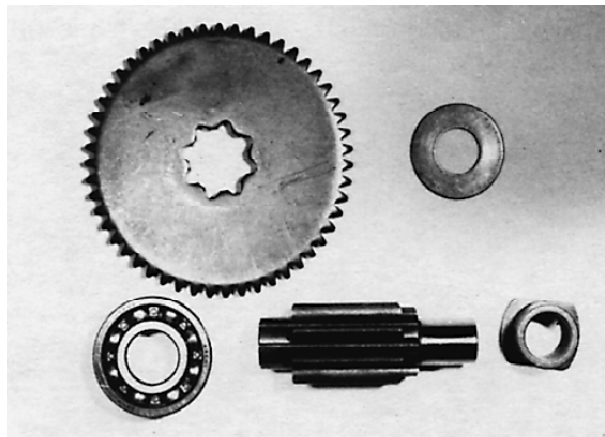


Figure 110

Install the pinion shaft in the upper case.

Note: Place the bushing on the end of the pinion shaft so that the flat surface of the bushing collar rests parallel to the top case surface.

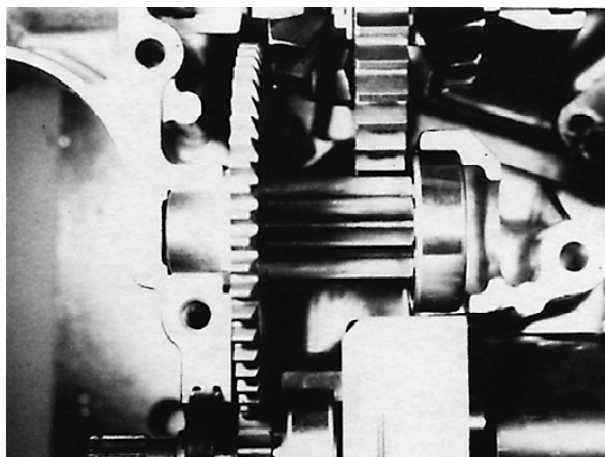


Figure 111

Transaxle Case

You can significantly speed up the filling and bleeding process by adding oil to the upper case half before installing the lower half. To do this, plug the oil vent hose fitting. Secure the case so it does not move, and then fill it to half full with oil.

Thoroughly clean the mating surface of each case half. Apply a thin, even bead of Loctite 587 or Permatex Ultra Blue RTV sealant to the upper case mating surface.

IMPORTANT: Do not turn the transaxle over until the sealant has had time to set up.

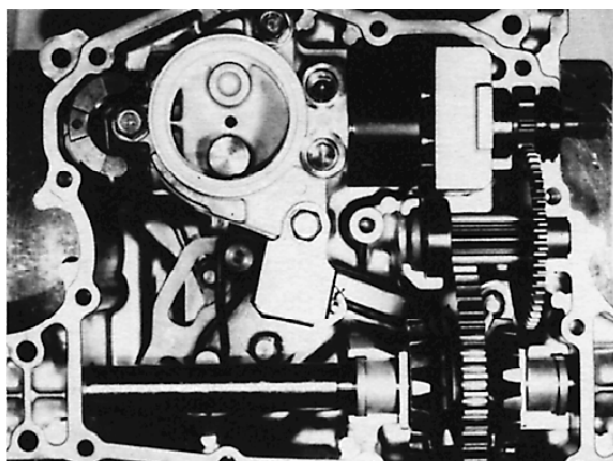


Figure 112

Note: Apply sealant to the inside surface around the bolt holes, and to the surface of the inner boss for the single center bolt.

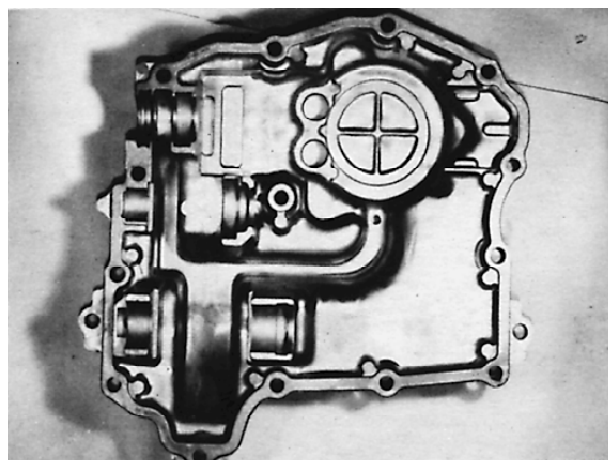


Figure 113

Join the lower case to the upper case.

<u>Torque Sequence</u>	<u>Torque Value</u>
1	280 in. lbs. (31.6N·m)
2	280 in. lbs. (31.6N·m)
3	280 in. lbs. (31.6N·m)
4	280 in. lbs. (31.6N·m)
5	280 in. lbs. (31.6N·m)
6	280 in. lbs. (31.6N·m)
7	280 in. lbs. (31.6N·m)
8	280 in. lbs. (31.6N·m)
9	280 in. lbs. (31.6N·m)
10	280 in. lbs. (31.6N·m)
11	280 in. lbs. (31.6N·m)
12	300 in. lbs. (33.9N·m)
13	300 in. lbs. (33.9N·m)

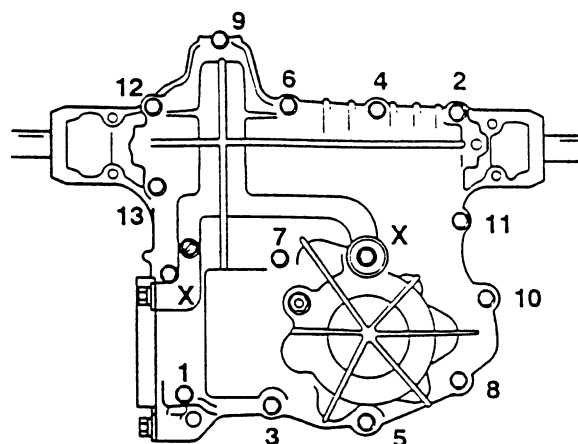


Figure 114

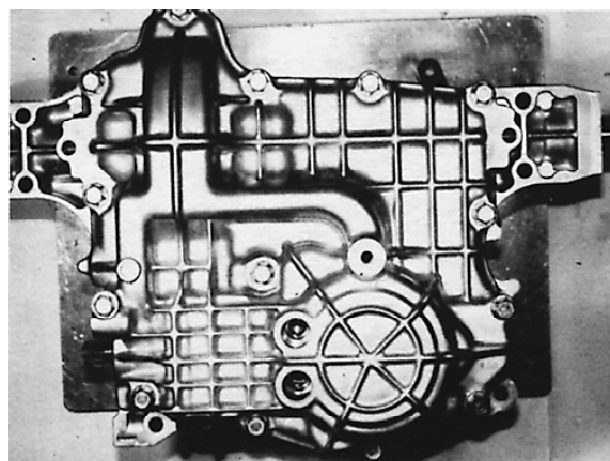


Figure 115

Install new packings (o-rings) on the pressure fill connector.

Attach the connector to the center case through the lower case. (Install finger tight if planning to bleed air from transaxle before installing in tractor.)

Note: For quick air bleeding, apply new oil into the connector hole of the center case while rotating the pump and motor shaft by hand. See **Bleeding Air from the Oil Circuit**. Be sure sealant has had time to set up before completely filling transaxle with oil.

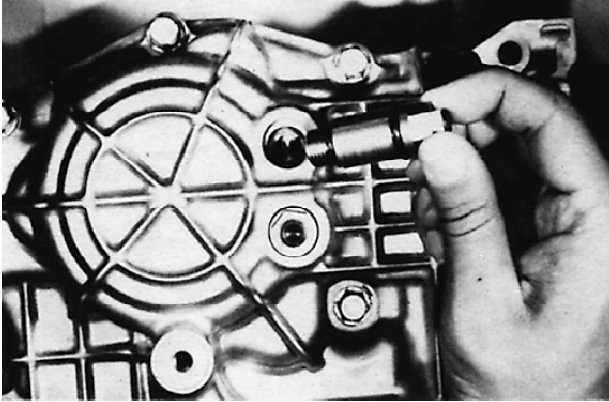


Figure 116

Secure the drain bolt to the lower case using a new seal washer. Tighten using a torque of 9 ft. lbs. - 12 ft. lbs. (1.3N·m - 1.7N·m).

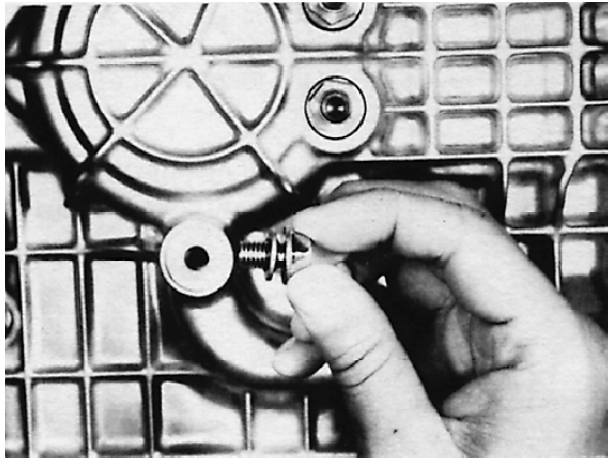


Figure 117

Brake

Secure the brake drum to the motor shaft with retaining ring.

IMPORTANT: The brake drum must be free from oil or dust.

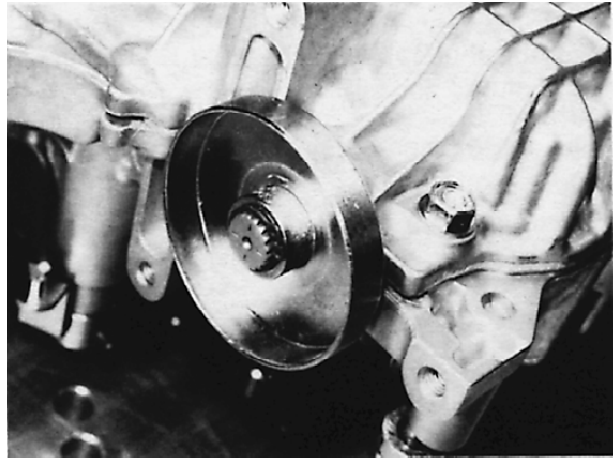


Figure 118

Attach the band brake using the three bolts. Secure the bolts while pushing the band brake assembly toward the lower case side. Tighten using a torque of 16 ft. lbs. - 21 ft. lbs. (2.3N·m - 3.0N·m).

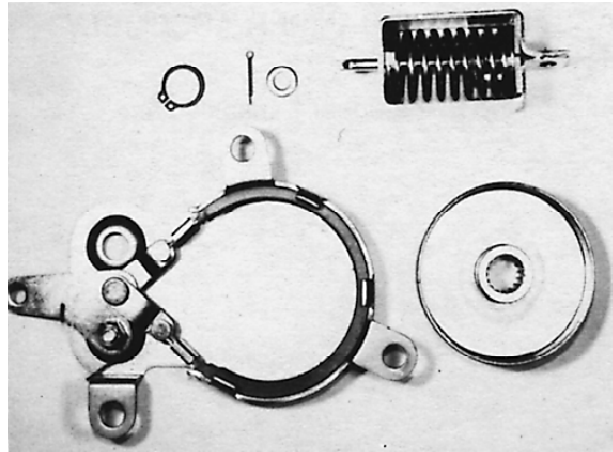


Figure 119

Attach the brake rod to brake arm. When inserting the rod (adjuster) into the hole on the brake cam lever, adjust the length of the rod to fit the brake arm hole.

Put the brake rod component onto the band brake and install the washer and cotter pin on the brake rod.

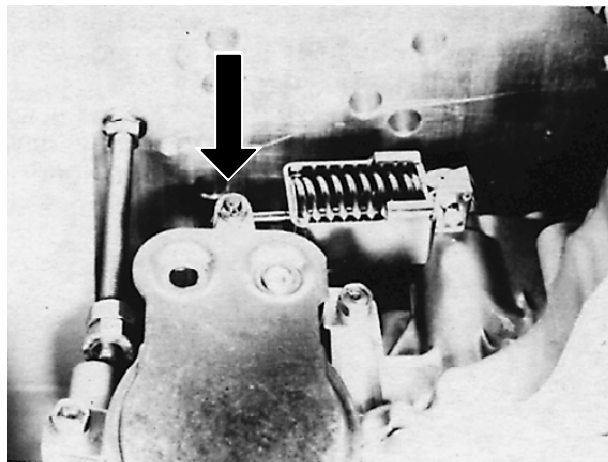


Figure 120

Damper

Attach stud to the upper transaxle case.

Install the shock absorber, washer, and cotter pin on the stud. (Later production is secured with spring clips.)

Install the washer and ring.

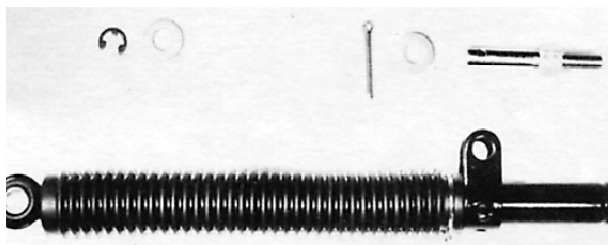


Figure 121

Bleeding Air from the Oil Circuit

Unit Out of Tractor

You can bleed the transaxle oil circuit free of air before installing it in the tractor.

Plug the reservoir/fill hose port on top of the transaxle.

Position the transaxle with the bottom side facing up.

Rotate the input shaft by hand while adding approximately 2 quarts (1.9 liters) of SAE 10W-30 API Service Classification SH or higher oil through the transaxle pressure fill port.

Note: Alternate oil—a synthetic oil (5W-50 or similar viscosity range) may be used in place of SAE 10W-30. This oil will permit an increase in the maximum operating temperature of approximately 18°F (10°C).

Install the transaxle in the tractor.

Top off the reservoir with oil through the reservoir/fill cap, filling it to the cold fill mark.

Test operate the transaxle as described in the following section, and make sure transaxle is filled to the correct oil level.

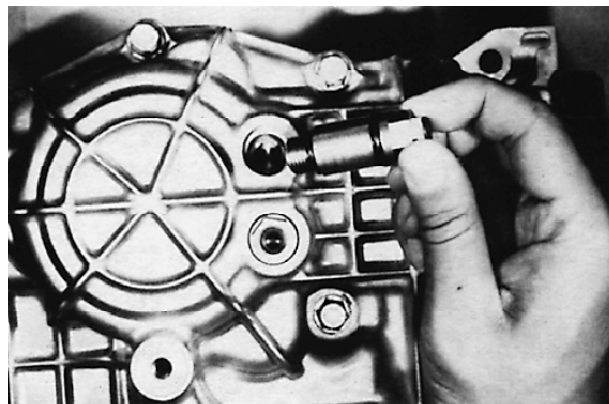


Figure 122

Unit in Tractor

Bleed the oil circuit so that it is free of air whenever you install a new or rebuilt transaxle in the tractor.

Add SAE 10W-30 API Service Classification SH or higher oil to the transaxle through the reservoir fill cap. Fill to the reservoir's cold fill mark. Attempt to get as much air as possible out of the hose before starting the bleeding process.

Note: Alternate oil—a synthetic oil (5W-50 or similar viscosity range) may be used in place of SAE 10W-30. This oil will permit an increase in the maximum operating temperature of approximately 18°F (10°C).

Raise the two rear tires from the ground and support the tractor securely with jack stands.

Disconnect the seat switch and attach a jumper wire across the terminals so that the tractor will run without an operator in the seat.

Start the engine and maintain low idle speed.

Depress the forward and reverse hydrostatic control pedals alternately until the wheels begin to rotate. Shut engine off.

Lower the tractor to the ground.



Use extreme caution while completing the following bleeding process.

Restart the engine and set at low idle speed.

Depress the forward hydrostatic control pedal and push the tractor rearward. Then depress the reverse hydrostatic control pedal and push the tractor forward until the tractor is able to move under its own power.

Increase engine speed to full RPM.

Operate the tractor, making quick starts and panic stops, until the transaxle is operating properly. Top forward speed is 5 MPH–5.5 MPH (8km/hr–8.8km/hr).

Top off the reservoir with oil through the reservoir/fill cap, filling it to the cold fill mark.

Note: Transaxle oil capacity is 3.5 qts. (3.3 liters).

Transaxle Neutral Adjustment

You must perform a neutral adjustment whenever a tractor creeps in neutral, or whenever a new or rebuilt transaxle is installed in the tractor.

Remove the access panel at the rear of the tractor to gain access to the neutral adjusting eccentric, which is located on the top right-hand side next to the gas damper arm. (Fig. 123 shows wrench applied to eccentric—seat, fender, and fuel tank are removed in photo for clarity.)

Raise the rear wheels off the ground and support the tractor securely on jack stands.

Disconnect the seat switch and attach a jumper wire across the terminals. This enables the tractor to run without an operator in the seat.

Set engine speed at full throttle.

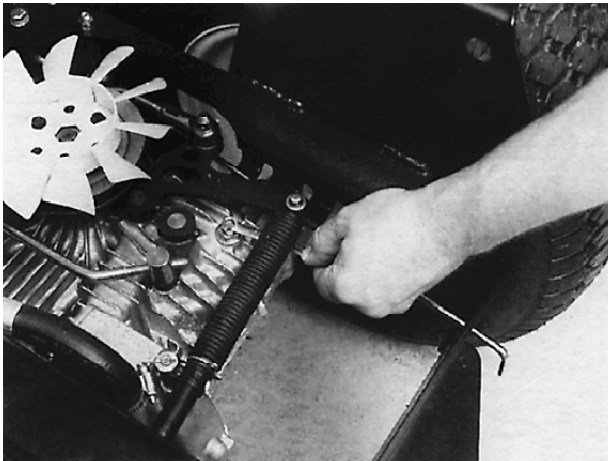


Figure 123

Loosen the locknut, B, and turn the eccentric, A, counterclockwise until the wheels start to rotate forward, C.

Turn the eccentric clockwise until the wheels begin to rotate in reverse, D.

Move the eccentric to the center of the neutral band, E, and tighten the locknut.

Check the neutral adjustment by depressing the motion control pedal in forward and reverse. At full throttle, there should be no wheel movement after the pedal returns to neutral. Readjust as needed until neutral is obtained.

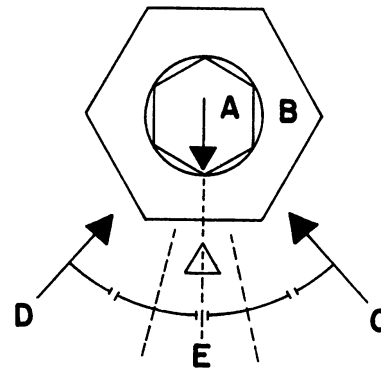


Figure 124

Belts and Linkage

Belt Replacement

Note: Perform V-belt installation, routing, and inspection procedures from beneath the tractor.

Take out the four screws holding the tunnel cover in place. Remove the cover.

Detach the belt tension spring, A.

Disconnect the electric clutch wire.

Remove the two steering link rods from the sector gear.

Disconnect the brake rod from the transaxle.

Detach the hydrostatic control rod from the hydrostatic pedal lever, B.

Disconnect the brake pedal safety start switch wires and remove the bracket to which the switch(es) is/are mounted.

Loosen the rear bolt and remove the front bolt retaining the right-hand footrest to the frame (provides brake shaft clearance).

Remove the hydrostatic cross shaft support brackets from both footrests, C.

Remove the far right pin only (the pin closest to the hydrostatic pedal), D, from the hydrostatic cross shaft. (Later models do not have pins.)

Note: There are three pins in the hydrostatic cross shaft. Do not remove the other two pins.

Slide the hydrostatic cross shaft, E, to the left and remove the hydrostatic pedal assembly, F.

Remove the roll pin from the left end of the brake cross shaft, G.

Move the brake cross shaft to the right and route the V-belt out of the tractor.

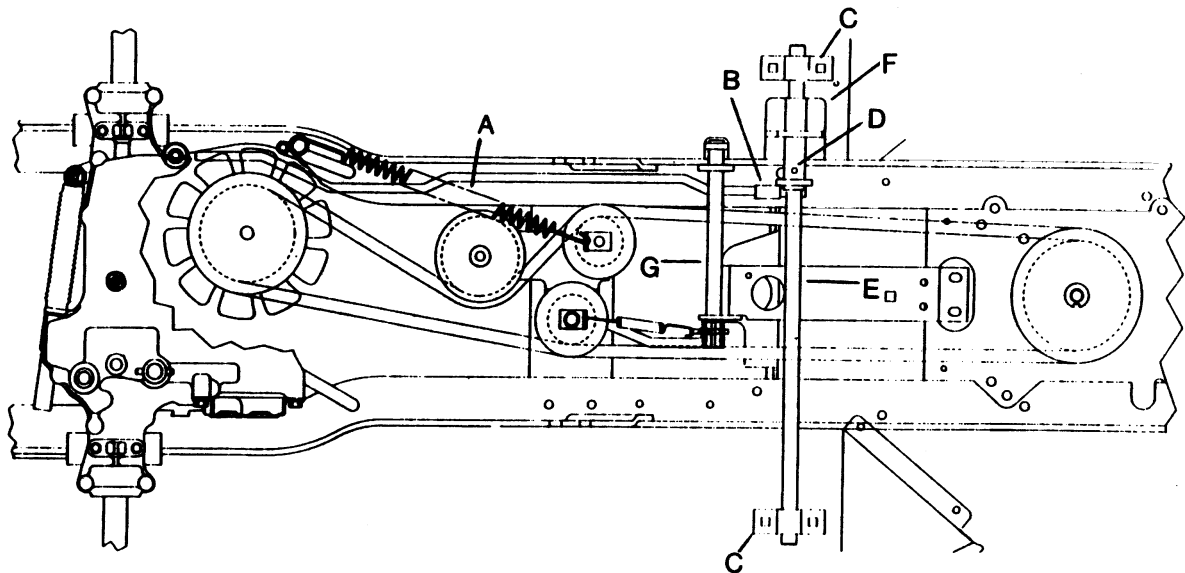


Figure 125 – Bottom View

- | | |
|--|-------------------------------|
| A. Belt tension spring | E. Hydrostatic cross shaft |
| B. Hydrostatic control rod | F. Hydrostatic pedal assembly |
| C. Hydrostatic cross shaft support bracket | G. Brake cross shaft |
| D. Hydrostatic cross shaft pin | |

Belt Routing—Bottom View

The drive belt contacts a single V-idler pulley on the left side as it is routed from the engine pulley to the transaxle pulley.

As it travels back from the transaxle pulley to the engine pulley, it passes between a pair of idler pulleys (a flat idler pulley and a V-idler pulley).

All three idler pulleys are mounted to the idler arm. Two pulleys are spring loaded; one is held in place with an eccentric.

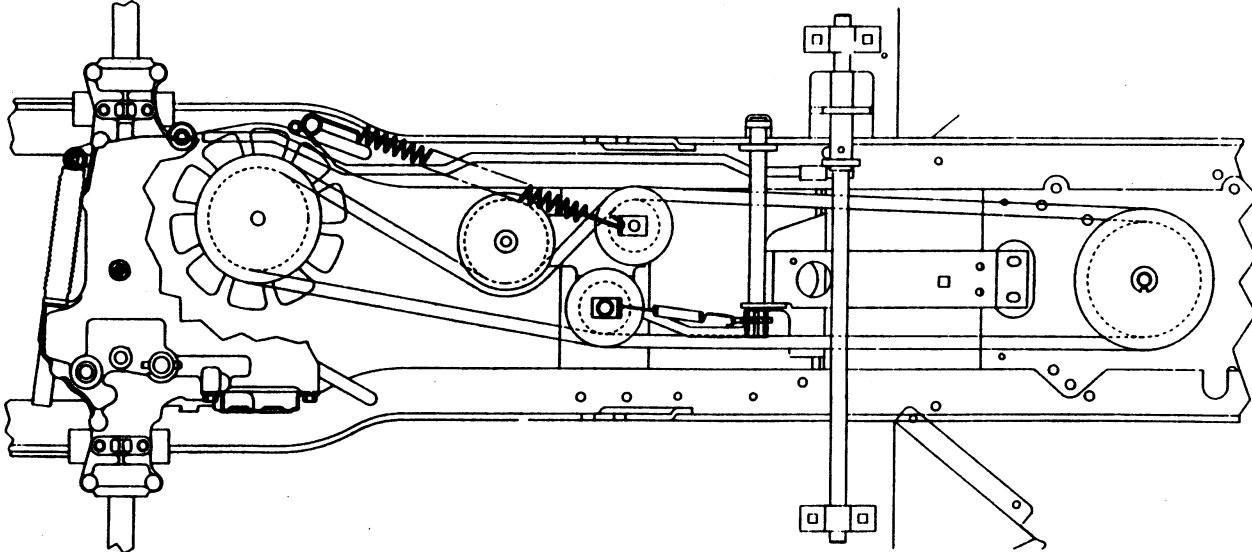


Figure 126

Reassembly

After routing the V-belt, reconnect the following parts:

- Belt tension spring
- Electric clutch wire
- Two steering link rods at the sector gear
- Brake rod at the transaxle
- Hydrostatic control rod at the hydrostatic pedal lever
- Brake pedal safety start switch
- Hydrostatic cross shaft support bracket at each footrest
- Far right pin in the hydrostatic cross shaft (N/A, newer models)
- Hydrostatic pedal assembly
- Roll pin in left end of the brake cross shaft

Finally, secure the tunnel cover in place.

Belt Adjustment

Remove the tunnel cover to check or adjust belt tension.

Loosen the back side idler pulley, A, and move it in the slotted mounting hole on the idler arm, B.

For additional adjustment, turn the eccentric, C, on the eccentric mounted idler pulley, D.

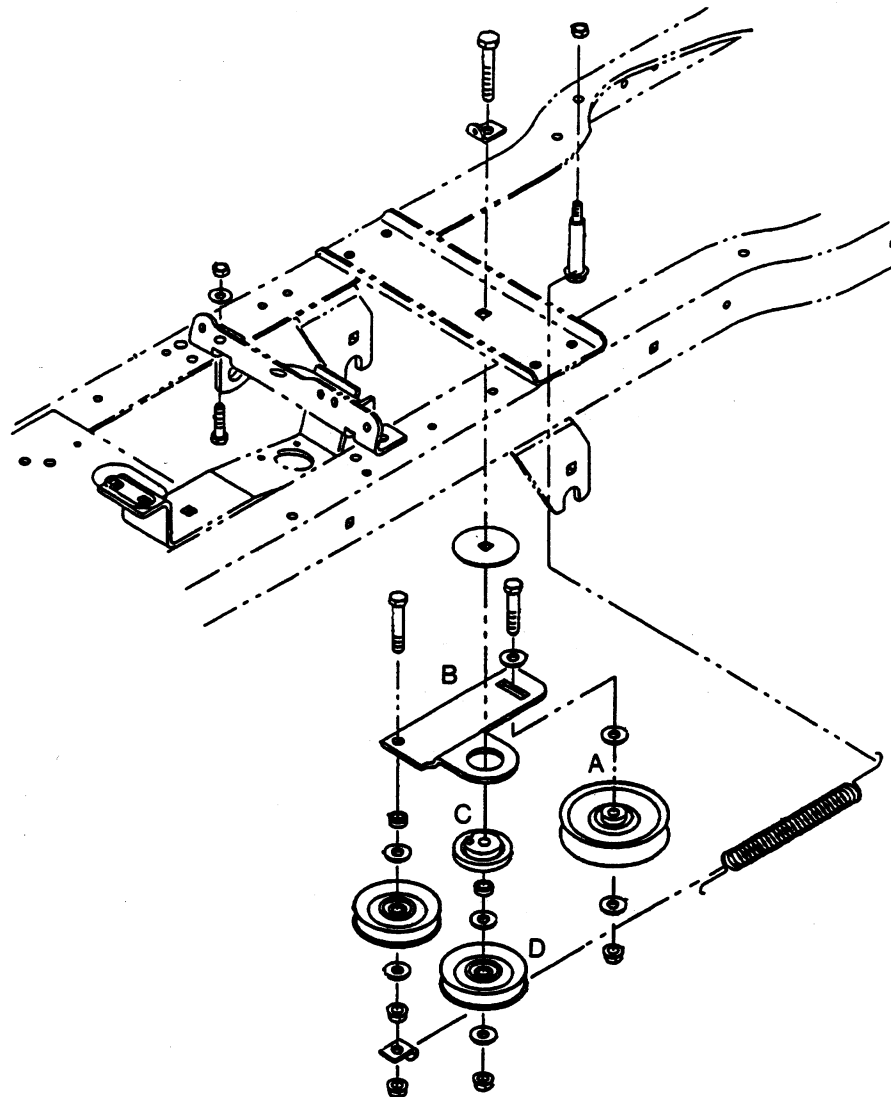


Figure 127

- | | |
|---------------------------|-----------------------------------|
| A. Back side idler pulley | D. Eccentric mounted idler pulley |
| B. Idler arm | |
| C. Eccentric | |

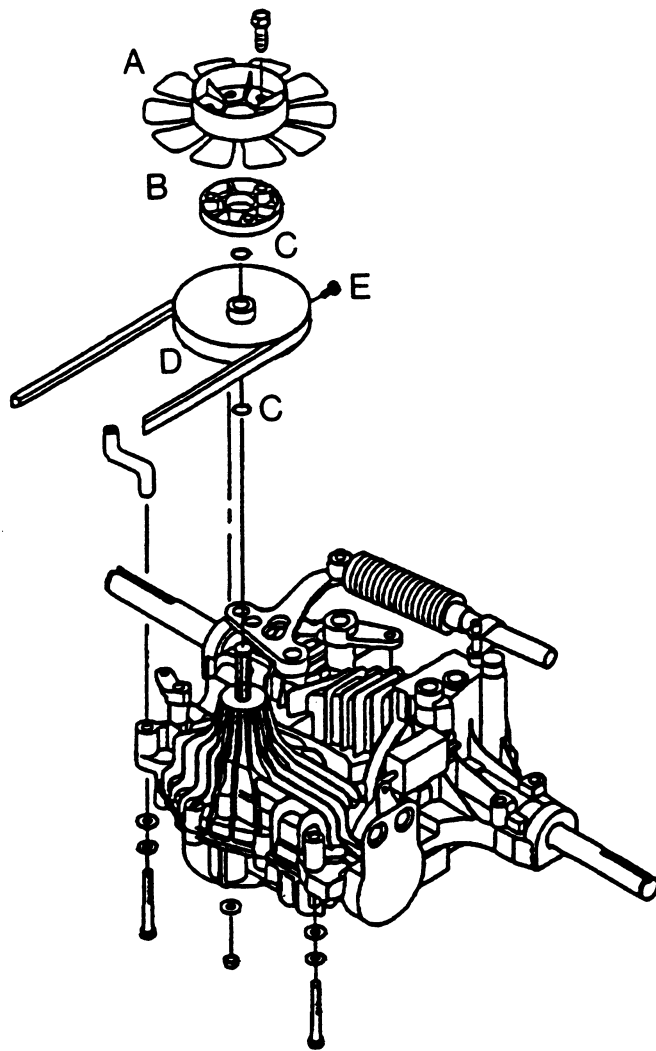


Figure 128

- | | |
|---------------|----------------------------|
| A. Fan | D. Pulley |
| B. Fan spacer | E. Setscrew 1/4"-20 x 1/4" |
| C. Snap ring | |

Brake Linkage

Foot Brake

Description and Operation

The foot and parking brake linkage consists of the following main components:

- Brake pedal
- Brake lever
- Brake rod
- Return spring
- Trunnion
- Parking brake lever

When the brake pedal, A, is depressed, the brake lever, B, (located on the other end of the brake pedal shaft) rotates. This activates the brake rod, C, and return spring, D, which are both connected to the brake lever. The other end of the return spring is fastened to a bracket located below the eccentric-mounted idler pulley.

The action is then transferred to the trunnion, F, which connects the threaded brake rod to the control lever, E, on the transaxle, stopping the tractor.

Adjustment

Move the control lever, E, to its most rearward position and hold it there.

Adjust the trunnion, F, on the brake rod, C, until it slips into the control lever, E.

Parking Brake

Description and Operation

When the brake pedal, A, is depressed and the parking brake lever, G, is lifted, the end of the parking brake lever lowers into position behind the brake lever, B. This prevents the return spring, D, from disengaging the brake when the brake pedal is released.

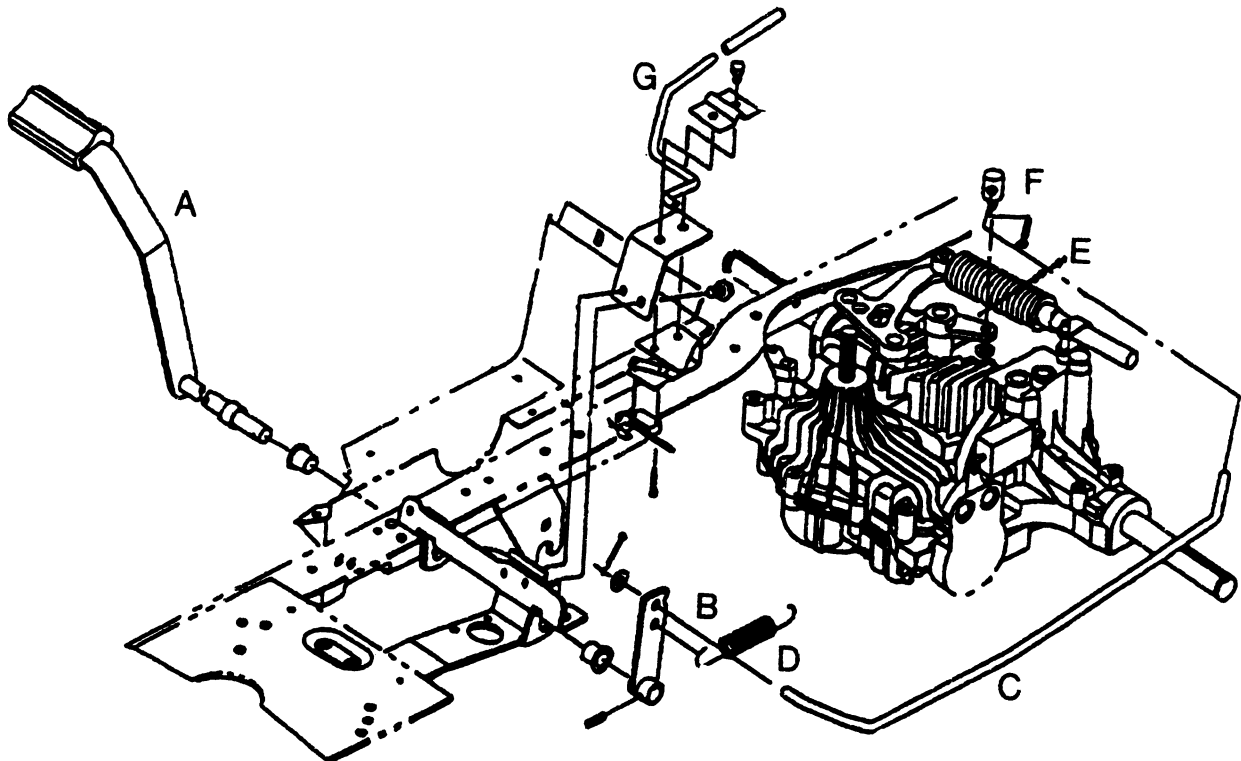


Figure 129

- | | |
|------------------|------------------------|
| A. Brake pedal | E. Control lever |
| B. Brake lever | F. Trunnion |
| C. Brake rod | G. Parking brake lever |
| D. Return spring | |

Transaxle Brake

Description and Operation

Fig. 130 illustrates the main components of the transaxle brake.

When the brake pedal is depressed, internal linkage pulls the brake control arm, A, forward and rotates the brake lever, B. This movement is then transferred to the brake rod, C, which rotates the brake shaft, D. The brake shaft projects through the top of the case and is attached to the brake arm, E.

When the brake arm rotates, it activates the brake spring assembly, F. The brake link assembly then allows only so much force to be applied to the brake band, G, for braking action. Because the brake band encircles the

brake drum, H, and the brake drum is splined to the hydrostatic motor output shaft, the tractor comes to a stop.

At the same time, the lobe, I, located on the brake lever acts upon the cam slot, J, profile of the swash plate control cam, K. This locks the hydrostatic control linkage in place (neutral position).

When the hydrostatic push valve is activated via a hand-operated rod at the rear of the tractor, the rod, L, connected to the brake lever is pulled to the end of the slot in the brake lever, B. When the brake is next applied, this rod rotates the push valve shaft, M, and actuator, N, and deactivates the push valve plungers, O.

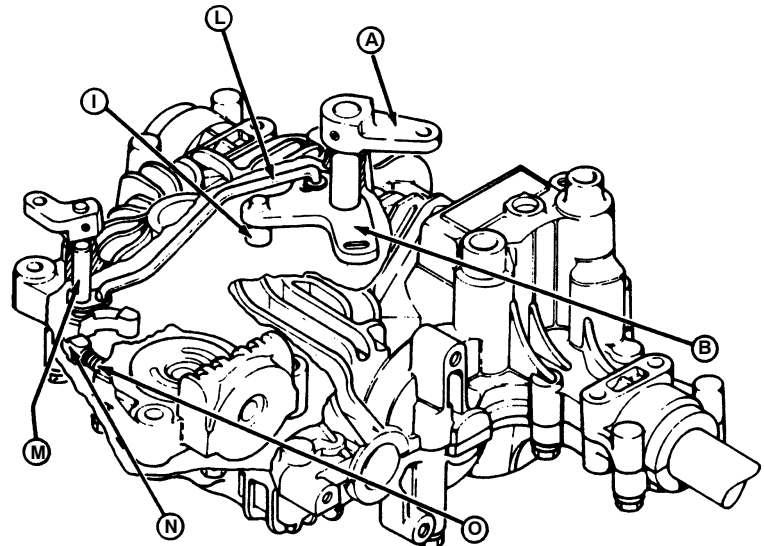
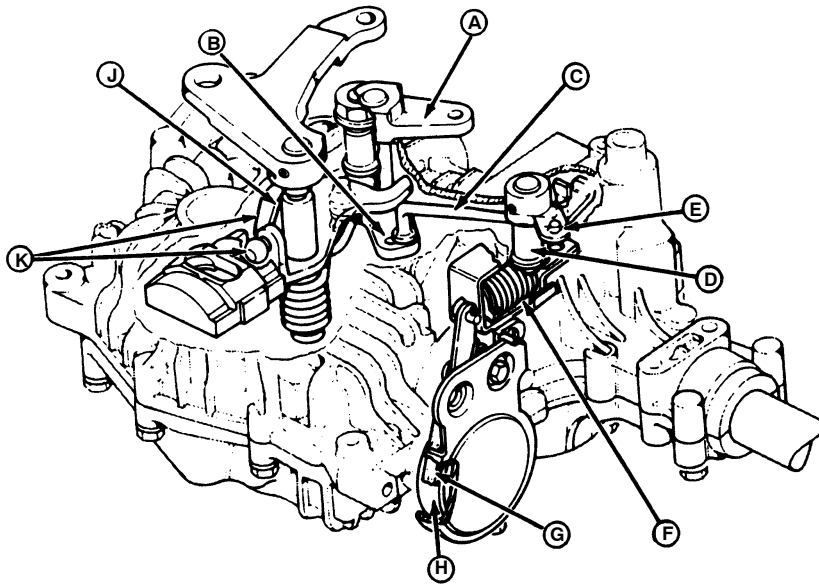


Figure 130

- | | | | |
|----------------------|--------------------------|---------------------------------|-----------------------|
| A. Brake control arm | E. Brake arm | I. Brake lever lobe | M. Push valve shaft |
| B. Brake lever | F. Brake spring assembly | J. Swash plate control cam slot | N. Actuator |
| C. Brake rod | G. Brake band | K. Swash plate control cam | O. Push valve plunger |
| D. Brake shaft | H. Brake drum | L. Push valve rod | |

Brake Band Adjustment

Loosen the rod, A, from the brake band assembly, B.

Move the brake lever, C, to its most rearward position and hold it there.

Adjust the rod, A, until it slips easily into the hole in the brake band assembly actuator arm, D.

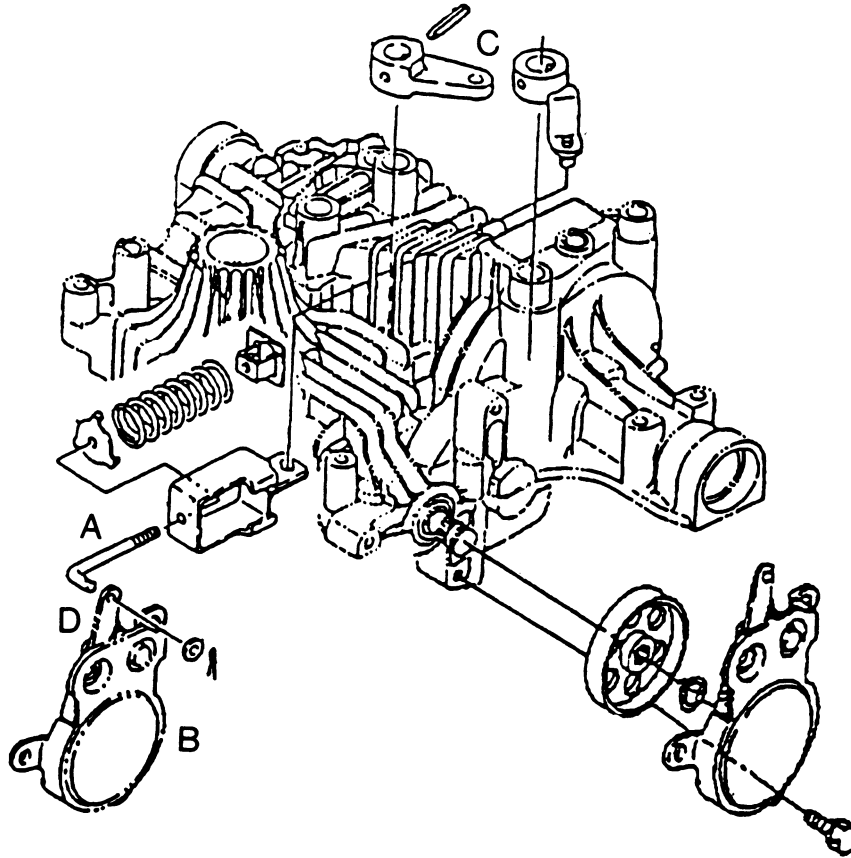


Figure 131

- | | |
|------------------------|-------------------------------------|
| A. Rod | D. Brake band assembly actuator arm |
| B. Brake band assembly | |
| C. Brake lever | |

Hydrostatic Control Linkage

Description and Operation

The hydrostatic control pedal assembly has a forward and reverse pad and is fitted to the cross shaft, C, for rotation. One end of the control rod, D, is attached to the pedal assembly; the other end is attached to the transaxle control arm, E. The ends of the control rod are threaded.

When the pedal is depressed, the control rod moves the transaxle control arm. When the pedal is released, the transaxle control arm's internal spring deactivates the control rod, returning the transaxle to the neutral position.

Lubrication

Grease the hydrostatic control pedal after every 50 hours of operation.

Pedal Adjustment

Remove the rear fender and seat assembly.

Take out the two fuel tank mounting bolts. Remove the tank and set it to the left side of the tractor.

Loosen the jam nut and remove the bolt from the rear rod end of the control rod, F (where it fastens to the transaxle control arm, E).

Adjust the rear rod end, F, of the control rod, D, so that the rear edge of the control pedal reverse pad, B, is 1.25" (32mm) from the footrest.

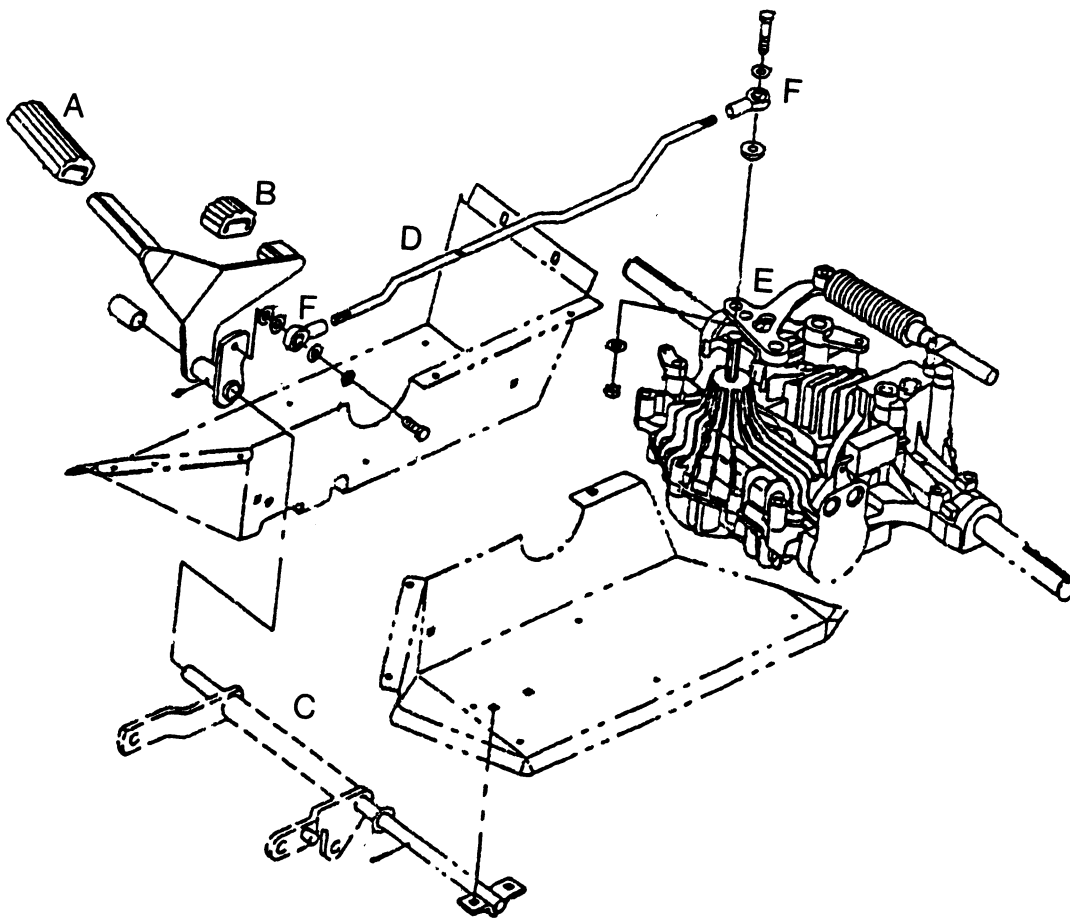


Figure 132

- | | |
|----------------------|----------------|
| A. Forward pedal pad | C. Cross shaft |
| B. Reverse pedal pad | D. Control rod |
| | E. Control arm |
| | F. Rod ends |

Cruise Control

Description and Operation

The hydrostatic transaxle can be held at a desired speed with cruise control, standard equipment on some models. Its effect on the transmission system is described below. For electrical troubleshooting, refer to the Toro Riding Products Demystification Guide, form 492-4509.

The cruise control is activated by a three-position rocker switch located on the right-hand side of the dash panel. Cruise can be set with the ignition switch in the LIGHTS or RUN position. A green light on the rocker switch illuminates to indicate that the cruise control is ON.

After starting the tractor and reaching the desired operating speed, engage the cruise control by placing the control switch in the SET position. This activates the electromagnet which holds the hydrostatic pedal in place.

The cruise can be disengaged by depressing the brake pedal or by placing the rocker switch in the OFF position. Electrical current to the magnet is interrupted, and the hydrostatic pedal returns to neutral.

Cruise control will function with the hydrostatic pedal in either the forward or reverse position.

The tractor cannot be started with the cruise control engaged. To start the tractor, the brake pedal must be depressed, and this disengages the cruise feature.



Figure 132

Components

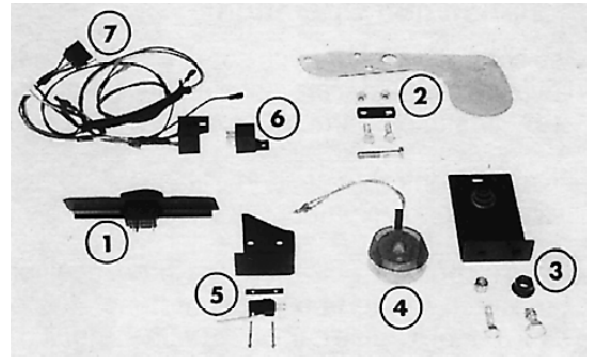


Figure 133

- | | |
|--|--------------------------------------|
| 1. Rocker switch and housing | 4. Magnet |
| 2. Plate-hydrostatic control arm and bracket | 5. Brake switch and mounting bracket |
| 3. Bracket magnet | 6. Relay |
| | 7. Wire harness |

Plate-Hydrostatic Control Arm and Housing

The plate is mounted to the hydrostatic control arm by a bracket. Because of the plate's thickness, a longer bolt is needed to fasten the hydrostatic linkage to the control arm.

The magnet's electrical leads are routed along and tied to the hydrostatic reservoir hose. These leads must not come in contact with any moving parts, i.e., the fan, belts, pulleys, linkage, etc.

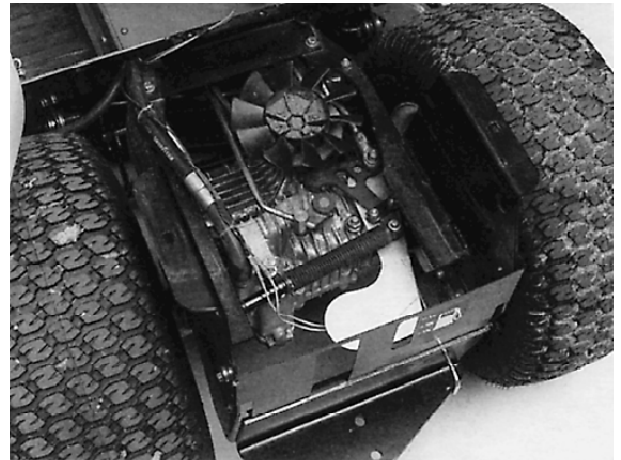


Figure 134

Bracket Magnet

The bracket which holds the magnet is secured to the frame by two bolts and locknuts.

Magnet

The magnet is located on the spring post of the bracket. It is correctly seated when the tab is inserted through the bracket slot.

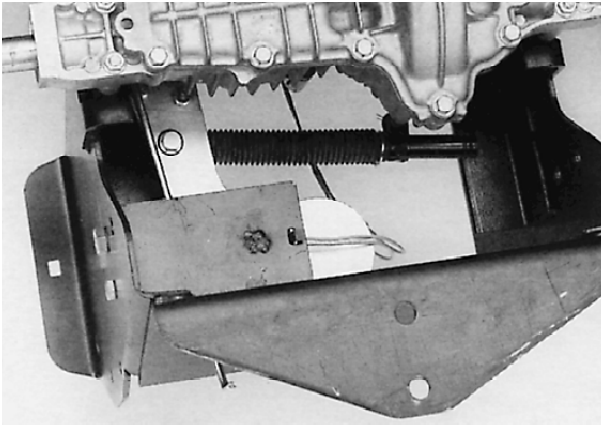


Figure 135

Relay

A fourth relay is added to the relay panel when cruise control is installed. The relay receptacle on the cruise wire harness attaches to the existing receptacle on the relay panel.

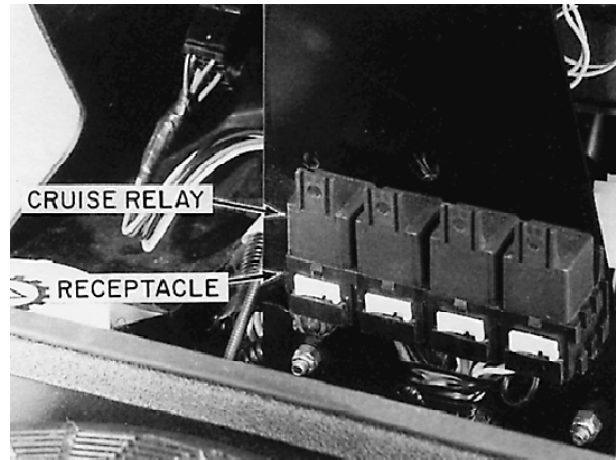


Figure 137

Brake Switch and Mounting Bracket

A second brake switch is used with cruise control. It is mounted back to back with the brake safety start switch.

The bracket has a slotted hole, allowing for adjustment of the switches. The cruise brake switch should be adjusted to disengage when the brake pedal is slightly depressed.

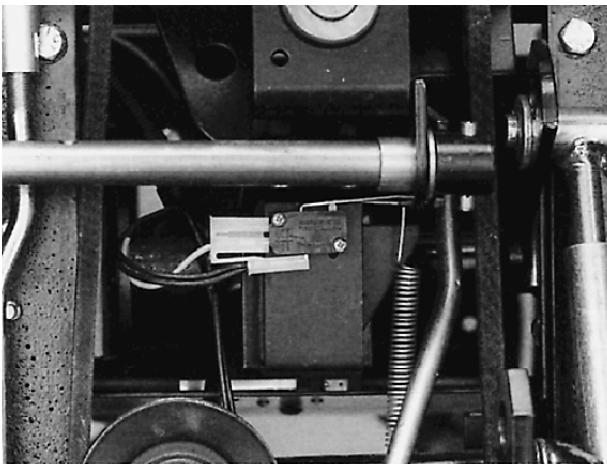


Figure 136 - Bottom View

Troubleshooting

Problem	Possible Cause
No drive	<ul style="list-style-type: none"> Incorrect oil/oil level in unit Drive belt has failed, is worn, or tension is out of adjustment Push valve in push position Parking brake engaged Control pedal linkage Engine pulley or transmission pulley Hydrostatic filter plugged Push valve plunger, springs, or valve body Directional valves stuck or spring broken Damage to rotating groups or valve body Damaged pinion shaft or differential assembly
No drive—one direction	<ul style="list-style-type: none"> Control pedal bent or broken Control pedal rod bent or binding Control arm roll pin sheared Directional valves sticking, broken springs, or need to be cleaned of debris
Low power—both directions	<ul style="list-style-type: none"> Incorrect oil/oil level in unit Drive belt has failed, is worn, is out of position, at incorrect tension, or engine RPM Push valve partially activated Parking brake engaged or binding Control pedal or linkage binding Engine or transaxle drive pulleys loose, damaged, worn Hydrostatic filter plugged Directional valves sticking, need to be cleaned of debris, broken springs Damage to rotating groups or valve body Swash plate worn, damaged, not operating properly Damaged output pinion or differential assembly
Low power—one direction	<ul style="list-style-type: none"> Incorrect oil/oil level in unit Control pedal or shaft bent, binding, or travel Control rod bent or binding Control arm is not secure on shaft Clogged oil filter Swash plate worn, damaged, or not operating properly Check directional valve plungers for binding, broken spring, debris, or leakage Differential assembly binding or damaged

Problem	Possible Cause
Creeps in neutral	Neutral adjustment eccentric out of position Control pedal bent or binding Control rod bent or binding Swash plate control lever pin damaged, bent, binding, or worn Swash plate cradle bearings failed, worn, or damaged Swash plate control arm ball and socket damaged or worn Neutral return spring failed, fatigued, or out of position

