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TRANSMISSION DESCRIPTION

The Skid Steer Transmission consists of two similar but symmetrically opposite transmission halves separated by a center plate. Many components are identical in both halves. Sun gears, pinions, carriers, ring gears, and shift collars are identical in both halves. Transmission cases, shift levers, and brake bands are similar but symmetrically opposite.

A shift collar splined to each output shaft is moved in or out by external diamond shaped levers to engage either the ring gear or carrier hub splines. The output shaft is locked to the carrier drum when forward is selected. The ring gear drum is locked to the output shaft when reverse is selected.

Each transmission half may be individually controlled by a selector which permits selecting either forward (F), neutral (N), or reverse (R). Each transmission half has a "u" channel brake lever which is used to control two bands. The two bands in each transmission half are applied or released as required to cause neutral, driving, or braking as required.

It should be realized that transmission braking function is provided for steering. For safety, additional braking should be maintained to stop and hold vehicle.

SPECIAL NOTE

The transmission of power, steering, and braking is provided in our transmission when it is positively engaged in forward or reverse and the drive system from transmission output sprockets to the wheel axles, provided by the vehicle manufacturer, is intact. If the transmission is in neutral or if there is a failure in the chain or driving system to the axles, then no braking can be obtained from the transmission. Make certain that you and/or the operator realizes the transmission braking limitations. All vehicles utilizing the Skid Steer transmission must have a secondary braking system.

General Operating Instructions

THE FOLLOWING APPLIES TO VEHICLES UTILIZING THE SKID STEER TRANSMISSION. REFER TO THE VEHICLE OPERATOR'S MANUAL FOR CHANGES AND/OR ADDITIONS.

The vehicle's engine should be started with the transmission in forward or reverse gear. Unless the steering laterals are spring loaded forward the laterals will "relax" allowing the engine to start without moving the vehicle. Certain manufacturers do spring load the laterals forward. Follow recommended starting procedures on those vehicles (Example: Start engine with transmission in neutral or reverse gear).

Select forward or reverse as required by moving the diamond shaped lever to the desired position, with vehicle gear shift system (SEE PHOTO). Both levers will normally be moved to the same selection. However, it is possible to select reverse gear on one side and forward gear on the other with individual shifting levers. This depends on the individual manufacturer's shift linkage arrangement.

It is extremely important that the transmission be fully engaged in gear. Proper engagement is indicated by the diamond lever flush against the transmission housing as shown in the photo. Damage to the transmission will result if power is applied to a partially engaged transmission (see trouble shooting chart). Do not expect the transmission to shift into gear easily every time. Gears within the transmission have to mesh to ensure proper shifting. Sometimes the gears mesh quickly and easily. Other times the vehicle will need to roll slightly to allow internal parts to rotate and align. Do not try to force into gear. Forcing will not cause gears to mesh. Spend some time when first operating the vehicle by observing the two diamond shaped levers atop each side of the transmission while shifting. You will notice that occasionally the levers will stop short of proper engagement. Rolling the vehicle slightly to rotate inner gears will allow you to fully shift into gear. Full engagement is mandatory in providing trouble free operation.

NOTE: If gears do not mesh (will not go into gear) either the collar (s) or ring gear drum (s) will need to rotate. The carrier plate is used for forward operation and the same would apply. To rotate internal gears while in neutral the following procedure is recommended: For reverse "Brake" the transmission and apply engine throttle. This will start the internal ring drum (s) to rotate and allow gear teeth to mesh. For forward push forward on the lateral (s) which will rotate the carrier plate (s) and apply adequate throttle. The above procedure will rotate internal gears. The output sprockets being able to rotate will also have equal results. Using a quick brisk motion, shift into gear while these components are rotating.

Do not attempt to shift the transmission on an incline. If the shifter happened to "hang" in neutral during shifting, steering and braking control is lost, and requires the use of the vehicle's secondary braking system for emergency stopping. It is recommended that a hill

should not be climbed in reverse gear unless the vehicles secondary braking system is adequate. Operators may loose control if depending fully on the transmission to stop and hold the vehicle.

Vehicle guidance is accomplished by moving the steering laterals (linked to the “u” channel bell crank) to each extreme end of throw as required to actuate driving or braking each side of the transmission. Adequate pressure should be applied to the laterals and maintained to prevent band slippage. Overheating will occur if the bands are allowed to slip excessively due to inadequate pressure. More pressure is required as load and terrain dictates. Slightly more pressure is required to maintain forward movement than the amount it takes to brake the transmission. Depending on the load and terrain, the operator should note that braking is very positive and requires little effort for steering, constant attention should be given to forward lateral pressure when the load dictates. Heavier vehicles (700 pounds or more) with heavy lugged tires require more attention to lateral pressure than lighter vehicles.

CAUTION: Do not use excessive force on the vehicle laterals. Band failure may result. Enough force to fail a band is considered abuse to the transmission.

INTERNAL LUBRICATION REQUIREMENTS

Transmission capacity is one quart (32 ounces). DO NOT OVERFILL. Automatic type “F” transmission fluid is recommended. For heavy duty applications Skid Steer recommends adding 4 ounces of automotive limited slip differential additive (NOTE: If using additive reduce type “F” fluid amount from 32 ounces to 28 ounces).

MAINTENANCE PROCEDURES

It is recommended that these guidelines be followed for proper maintenance of the transmission:

1. Check the oil level at the bottom check plug every 25 hours of operation.
2. For maximum life, the oil in the transmission should be changed every 50 hours of operation. This is accomplished by raising the front of the vehicle with the lower transmission plug removed to allow the oil to drain as much as possible. Lower the vehicle and remove the top vent plug and refill only to the bottom of the lower drain plug hole. A suction gun with a small flexible hose can also be used to remove the transmission fluid.
3. Periodically lubricate the shift drum assembly beneath the diamond shaped shifter where it goes through the aluminum housing to prevent corrosion and binding of the shifter mechanism.
4. Periodically check the transmission mounting bolts for tightness.

BAND ADJUSTMENT

Band adjustment may be required to compensate for normal wear. Adjustment is necessary only when there is excessive lateral travel after a long period of use. Excessive throws depend on the vehicles lateral design. On most vehicle laterals the only components restricting further travel of the lateral from one extreme to the other are the transmission bands. Lateral stoppage indicates the band is applying pressure to the planetary drums. This is assuming the linkage and laterals are not retarded from free movement.

DO NOT adjust the transmission bands for (1) strait direction control, (2) lateral position, and (3) weak performance on one or both sides (See trouble shooting chart).

Very minor band adjustments may be made to equal the amount of lateral travel. Equal parallel lateral alignment should be adjusted only with the vehicle linkage system.

ADJUSTMENT PROCEDURE: (For normal wear or when installing new bands)

1. Remove “u” channel bell crank hair pin spring clips.
2. With spring clip removed, position channel bolt retainer in order to turn the bottom hex head cap screw. Tightening this bolt will reduce forward travel throw. The amount of adjustment will depend on band wear. Try to provide a forward travel amount equal to that when the vehicle was new. Adjustment of the top hex bolt will depend on band wear. It may not require any if the bottom bolt adjustment has corrected the excessive travel. It is very important that adequate travel is provided to allow the bands to release freely. The bands are too tight if the hex bolt head will not return to the channel bolt retainers.
3. Replace channel lever clips. Repeat these steps on the other channel bell crank.

TROUBLE SHOOTING GUIDE

ZERO POWER OUTPUT ON ONE OR BOTH SIDES

1. Transmission remains in neutral gear
Reason: Shift pin has broken from shifting drum and not able to move collar back and forth. Collar remains in neutral position although diamond lever is moving (Replace part).
2. Output sprocket or chain damaged.
3. Band damage.

Reason: Sudden excessive travel in lateral indicates a broken band and can not operate planetary gear drums (Replace part).

REMAINS IN GEAR – even though shift lever is moving

1. Shift pin is broken
2. Collar groove is damaged

Reason: A section of the outer lip may be “busted” out. This would result in the shift pin not being able to move the collar out of forward. It will however move into forward. By rotating the collar (splined to output shaft) an undamaged portion of the collar will rotate in line with the shifter pin to allow a full shift. It is possible the broken pieces will damage other components.

POOR OUTPUT PERFORMANCE - Excessive lateral pressure required to brake and/or propel.

1. Band slipping (Assuming adequate input power)

Reason: (A) Band has worn out, causing metal-to-metal contact with planetary drum (s).
(B) Band has overheated and crystallized, causing a hard surface unsuitable for gripping the drums (Replace bands).

2. Inadequate lateral pressure to bands

Reason: (A) Linkage obstruction.
(B) Operator not exerting sufficient lateral force.

3. Ring gear drum bearing seized to shift collar (Uncommon)

Reason: (A) Excessive load.
(B) Lack of proper oil.

4. Engine power may be insufficient or torque converter failure.

Reason: Belt slipping or 2-cylinder engine running on one cylinder.

HARD TO SHIFT F-N-R

1. Diamond lever will not move with ordinary pressure

Reason: (A) Output chain (s) are too tight.

- (B) Shifting drum assembly binding to housing due to rust or damage.
 - (C) Shift linkage not operating properly.
 - (D) Shift collar binding to output shaft or ring gear drum.
2. Difficult to get in gear. Assuming the vehicles linkage is working properly, this is a characteristic of this sliding gear type manual shift. Do not expect an easy shift every time. When the output sprocket has difficulty rotating slightly, internal gears no not mesh easily.

WILL NOT STAY IN GEAR

CAUTION: Do not operate the vehicle in this condition.

1. Shift collar not moving through full travel

- Reason:
- (A) Shift pin worn excessively because:
 - 1. For proper operation the vehicle shifter system should allow the shift drum pin to float freely in the collar groove. While fully in gear the diamond lever should have a slight amount of play to allow the pin to center itself in the collar groove. By allowing it to center itself the pin will not wear against the collar groove.
 - 2. If power is applied to a partially engaged transmission the collar will try to “cam” out of gear. If the pin does not break it will wear very fast on one side. An excessively worn pin will not locate the collar fully into gear.
 - (B) Shift linkage obstruction.
 - (C) Operator did not shift fully into gear.

2. Shift collar detent spring failure (shift collar moves excessively easy) Do not operate the vehicle in this condition. Part must be replaced.

OVERHEATING

1. The ATF oil has a burnt smell.

- Reason:
- (A) Inadequate lateral pressure for terrain and load conditions.
 - (B) Too much oil.
 - (D) Bands adjusted too tight.
 - (E) Inadequate oil level.

NOTE: Transmission is not overheated if merely too hot to touch. Transmissions will run hotter during repeated sharp maneuvers. A hot transmission will cause water to steam.

OUTPUT SHAFT SEALS RUPTURE FROM HOUSING

- Reason: (A) Excessive oil level.
(B) Vent plug defective.

REPAIR AND REPLACEMENT

SHIFTER DRUM REPLACEMENT (See photos)

1. Remove internal snap ring in aluminum housing groove under diamond lever (NOTE: Some vehicle manufacturers omit this snap ring using an external bracket hold the assembly in place).
2. The shift drum assembly should lift out. It may require pressure to remove.
3. For in field repair or until a new shifter can be installed, shift the transmission into forward gear by sliding the collar in toward the center of the unit with a screwdriver.
4. It is not necessary to remove the broken shift pin. For field repairs, replace the broken shift drum in the exposed hole to retain the oil.

NOTE: Earlier built Borg-Warner transmissions utilized a "T" paddle shift pin. Some manufactures removed these paddles prior to installation in the vehicle. These paddles, if used, must be removed if broken. Contact Skid Steer for removal instructions. The "T" paddle pin is not recommended as a replacement part. The "T" paddle is used if the broken stem remaining in the shifter drum has a coarse inner texture and/or can be removed from the drum. A strait 1/4" needle bearing shift pin used by Skid Steer and some Borg-Warner built transmissions will break with a smooth inner finish. These pins are pressed in and cannot be removed.

5. Before installing a new shift drum assembly, observe through the exposed hole the grooved shift collar. Rotate the output sprocket to observe the rotation of this collar. Visually check for cracks or broken pieces near the outer lip. Replace the collar if damaged.
6. Lubricate the new shift drum before replacement.
7. With linkage removed, manually shift the diamond lever to check freedom of movement. There should be a definite detent indicating F-N-R.

The preceding shifter repair section accounts for 90% of all repair needs. This is the only type of repair that can be handled in the field. Proper tools however, are necessary. Any other component failure in the gearbox will have to be handled by an adequate mechanic who will have to remove and repair the transmission. This is not a complicated transmission and most dealers/mechanics are qualified to handle repairs. Damaged parts should be obvious, noting that each transmission half is almost identical. Factory consultation is available if required, along with complete rebuild capabilities. Skid Steer Incorporated is equipped to maintain all previously built Borg-Warner units. Repair parts are available from current vehicle manufacturers using the Skid Steer transmission. The following manufacturer incorporates the Skid Steer transmission into their vehicle, and are authorized to handle parts and service requirements:

Recreatives Industries, Inc.
60 Depot Street
Buffalo, New York 14206
Ph 716-855-2226
Fax 716-855-1094

LIMITED WARRANTY

Skid Steer Corporation warrants each transmission built by us to be free from manufacturing defects in normal service for a period of 90 days commencing with delivery of the transmission to the original user. This warranty does not apply to defects caused by damage or unreasonable use while in the possession of the consumer.

ANY IMPLIED OR STATUTORY WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXTREMELY LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. We make no other express warranty, nor is anyone authorized to make any in our behalf.

The following are not classified as manufacturing defects:

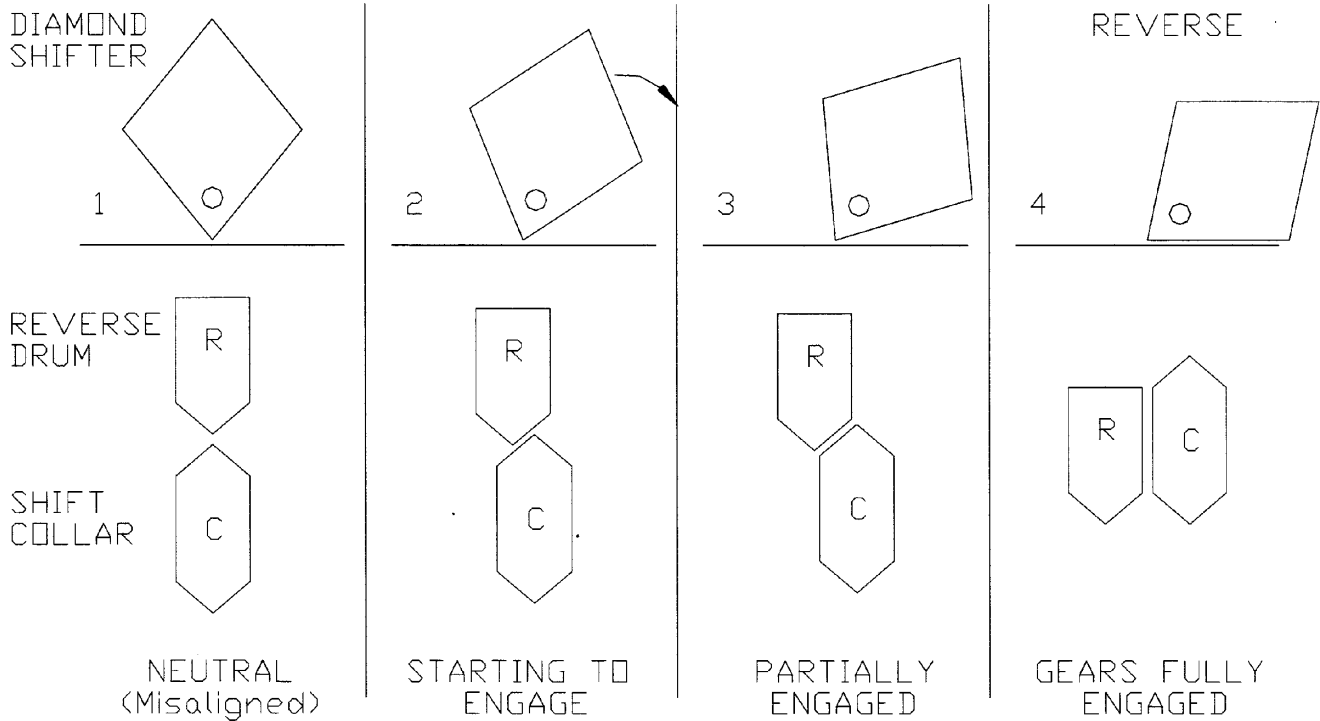
1. Shift pin and/or collar damage due to improper shifting.
2. Band failure due to breakage.
3. Damage due to lack of proper oil and/or level.

A flat rate labor standard will apply on repair.

PARTS FOR SKID STEER TRANSMISSION

KEY NO. DESCRIPTION	PART NO. NO. REQ'D	KEY NO. DESCRIPTION	PART NO. NO. REQ'D
SHIFTER GROUP			
1 Shift Lever, Right	1AT20-40	1 Washer, Carrier Plate	193-001
2 Shift Lever, Left	AT20-40	2 Washer, Sun Gear	193-002
3 O-Ring	4804-TT	3 Washer, Planet Gear (1 5/8)	193-003
4 Snap Ring	4828 J	4 Washer, Ring Gear Drum	193-004
5 Shift Collar	055-002	5 Washer, Planet Gear (1 3/16)	193-005
6 Spring Garter	T20-42		
THRUST WASHER GROUP			
HOUSING GROUP			
OUTPUT SHAFT GROUP			
1 Output Shaft, Right	671-007	1 Housing Assembly, Right	565-004
2 Output Shaft, Left	671-009	1 Housing Assembly, Left	565-002
3 Needle Bearing, Input	4840Z	N.I. Oil Pocket Washer	T20-58
4 Oil Seal	T20-106	N.I. Stud	4544DD
5 Snap Ring	4848L	2 Center Housing Plate	007-002
6 Bearing, Output	B207BS	3 Gasket	T20-145
7 Seal, Output	T20-110	4 Vent Plug	04-03-001-01
	4758A	1 Drain Plug	438159
PLANETARY GROUP			
BAND GROUP			
1 Carrier Drum	659-002	1 Brake Band, Left	AT20-33
2 Planet Gear	T20-5	2 Brake Band, Right	AT20-133
3 Needle Bearing	4840X	2 Band Clevis	T20-32
4 Carrier Plate	014-002	N.I. Roll Pin	453675
5 Ring Gear Drum	662-003	3 O-Ring	4804UU
6 Sun Gear	T20-4	4 Brake Lever	098-003
7 Input Shaft	189-002	5 Hair Pin Clip	056-003
8 C-Ring	4747E	N.I. Bolt Retainer	056-002
		N.I. Bolt	181639
		6 Band Anchor Rod	T20-51
		N.I. Sleeve	T20-44

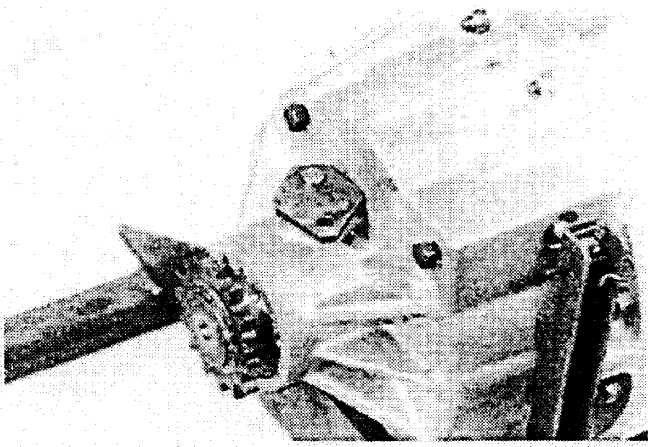
NOTE: The above parts are used in the manufacturing of Skid Steer Units. Parts for Borg Warner units using the brake lever shown are identical. Certain earlier built Borg Warner unit components are obsolete and service parts are not available. Contact factory for availability. When ordering parts specify if the transmission is not the later design. All transmissions using the brake lever shown are the later design. Skid Steer offers a service to rebuild aluminum housing and ring gear drum bushings.



GEAR SHIFT TEETH ILLUSTRATION

Occasionally Skid Steer gear shift teeth do not mesh easily. The above illustration shows how the collar teeth, when not in line with an “open” space will resist shifting. This is a characteristic of all sliding type gear arrangements. The components need to be able to rotate slightly and find an opening in which to mesh. Many times the gears will be in alignment and perfect shifting can be expected. As shown in illustration 2, the gear teeth will “clash”. The “roof top” chamfers will try to align the teeth by rotating each other. However, both and/or one of the components will have to be capable of rotating to provide alignment. Illustration 3 position is responsible for 90% of all transmission failures. If in this position the operator activates the reverse drum with adequate transmission input, damage will occur. The “roof top” chamfers will drive off each other and result in cramming action. This camming action will drive (force) the collar into neutral, as the reverse drum is rotating. By internally forcing the collar, splined to the output shaft, into neutral the shaft pin and/or collar will be damaged. The shift pin will attempt to hold the collar in gear. However, enough power is being applied to overcome it’s strength. Excessive wear or breakage will result to both the pin and collar. The operator can expect failure if illustration 3 is allowed to occur. Follow instructions for repair.

NOTE: The above only applies to reverse to Skid Steer manufactured transmissions. It will apply to both forward and reverse on Borg Warner units. Failure of shifting components is not a manufacturing defect. It is the result of improper shifting.



TRANSMISSION IN FORWARD GEAR

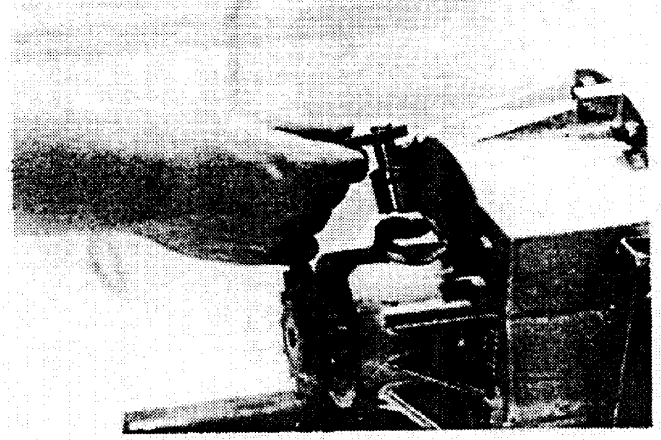


TRANSMISSION IN REVERSE GEAR

TRANSMISSION SHIFTER REPAIR PROCEDURES



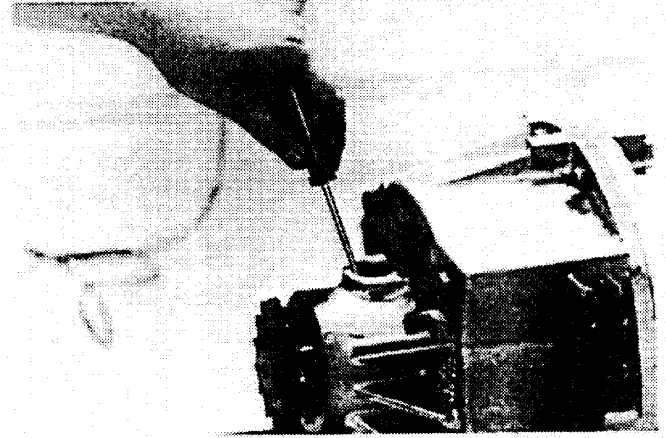
REMOVING SNAP RING



LIFTING SHIFT DRUM OUT



MAY REQUIRE PRESSURE TO REMOVE



SHIFTING WITH SCREWDRIVER

