ROCKWELL SINGLE SPEED

Ford
M450
M500

DESCRIPTION

The axle has a banjo-type housing with a removable carrier. The drive pinion is straddle mounted with opposed tapered roller bearings at the forward end and a straight roller pilot bearing at the rear. The pinion bearing preload is adjusted by substituting different sized spacers. The pinion depth is adjusted by shims. The preload of the differential side bearings is set by adjusting nuts on which the bearing cups rest. The differential has a two-piece case and four differential pinion gears.

AXLE RATIO & IDENTIFICATION

The Rockwell Single Speed axle is available in three different gear ratios: 4.33, 4.88, and 5.29. The ratio can be determined by dividing the number of ring gear teeth by the number of pinion gear teeth. Ford uses two different axles with a removable carrier. The Ford built axle has semi-floating axle shafts; the Rockwell axle has full floating axle shafts (the axle shafts can be removed without raising the vehicle off the ground).

REMOVAL & INSTALLATION

AXLE SHAFTS

Remove axle shaft stud nuts. Place a large drift at center of axle flange and strike sharply with large hammer. The axle rebound will loosen the tapered dowels. Remove tapered dowels. Using a piece of flat bar stock and a suitable puller screw, pull axle flange from wheel hub, then remove from housing. If thread load on puller screw becomes excessive before axle flange is pulled away from wheel hub, install a similar puller assembly at opposite side of flange and use both alternately to loosen flange. To install axle shaft, reverse removal procedure.

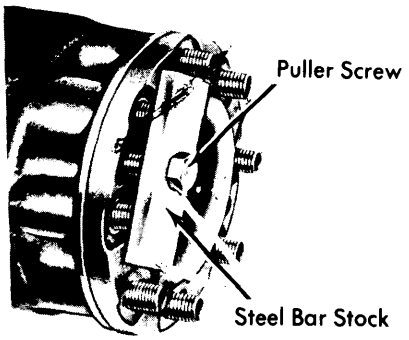

Fig. 1 Correct Procedure to Remove Axle Shafts

WHEEL BEARINGS

Removal – 1) Block front wheels, release parking brake, and loosen axle shaft stud nuts. Raise rear wheels off floor and install safety stands so that rear axle housing is parallel with floor. Remove axle shaft using procedure previously described. Bend lock washer tab away from lock nut, then remove lock nut, lock washer, and adjusting nut. Use a suitable jack to raise wheel slightly so that wheel weight is removed from wheel bearings.

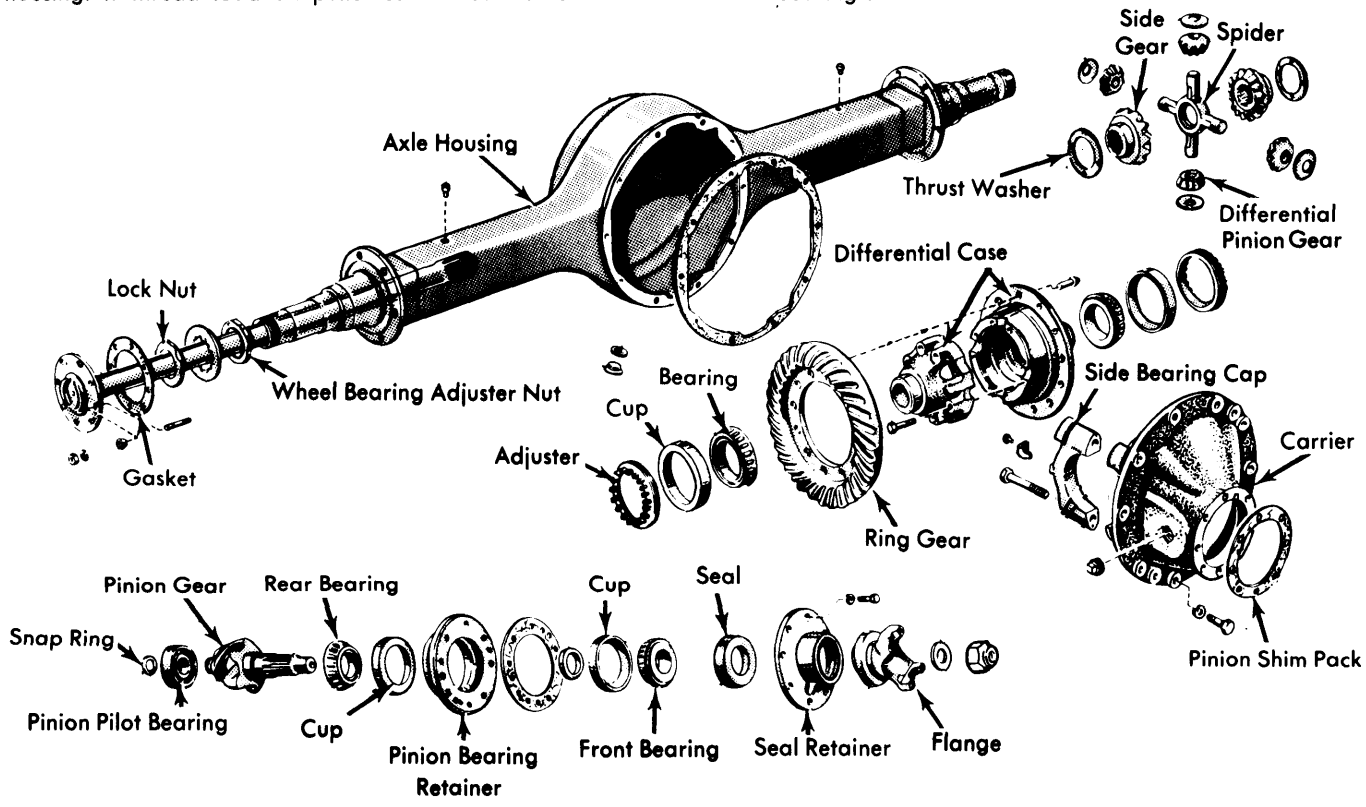

Fig. 2 Exploded View of Rockwell Single Speed Axle Assembly

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2) Remove outer bearing cone, then pull wheel STRAIGHT OUT and away from axle housing. Examine wear sleeve (removable seal journal) on axle housing spindle. If excessively worn or pitted, remove by making two indentations with punch 180° apart and slipping off spindle. To replace wear sleeve, drive into place using a suitable tool. Drive inner bearing cone and inner seal out of wheel hub. If bearing cups are to be replaced, drive out with drift using care not to damage machined bore.

Installation – **1)** Install new bearing cups into wheel hub using suitable tool (T53T-1239-A). Check for proper seating of cups by trying to insert a .0015" feeler gauge between cup and hub; it should not fit. Pack each bearing cone and roller assembly with grease. Place inner cone and roller assembly in hub, then install new seal. Apply a thin film of chassis lube to spindle and position a suitable seal protector over threads. Carefully slide wheel and hub assembly STRAIGHT ONTO axle housing spindle. Remove seal protector. Install outer bearing and adjusting nut.

2) Torque adjusting nut to 140 ft. lbs. while rotating wheel to seat bearings. Loosen adjusting nut ½ turn, then retighten to 50 ft. lbs. while rotating wheel. Loosen adjusting nut ⅓ turn, then install lock washer and lock nut. Adjusting nut may be backed off more if necessary to align lock washer and lock nut. Torque lock nut to 125 ft. lbs. Wheel assembly must have an end play of .001-.010". Do not preload the bearings. Lock nut in position with tab of washer.

PINION FLANGE & SEAL

Removal – Disconnect drive shaft from rear "U" joint pinion flange. Remove pinion flange from pinion shaft. *CAUTION – Under no circumstances should pinion shaft or flange be struck with hammer.* Remove oil seal retainer and gasket, then remove seal from retainer.

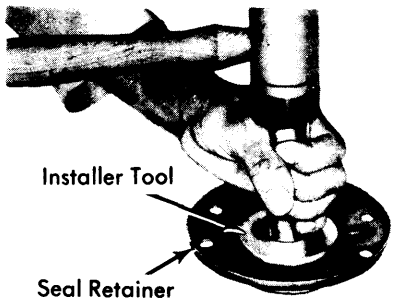

Fig. 3 Correct Procedure to Install Pinion Oil Seal

Installation – Coat outside edge of a new oil seal with an oil-resistant sealer and press it into oil seal retainer. Apply a light coat of Lubriplate to contact areas of seal and pinion shaft. Position retainer and new gasket against pinion bearing retainer. Install bolts and tighten. Install flange and tighten retaining nut. Connect drive shaft and check lubricant level of differential.

OVERHAUL

DISASSEMBLY

1) Drain and discard axle lubricant. Remove each axle shaft. Disconnect drive shaft at rear. Support carrier assembly with suitable roller jack, then remove carrier-to-housing attaching hardware. Using suitable puller screws, loosen carrier in housing. Remove carrier and discard gasket. Install carrier on suitable work stand.

2) If equipped, remove oil distributor pipe plug, spring and oil distributor from carrier. Loosen thrust block lock nut and screws, if equipped, then back out thrust screw to provide clearance between block and back side of ring gear. Mark differential bearing caps for reassembly reference. Remove adjuster lock from adjusting nuts. Remove bearing cap bolts and bearing caps. Lift differential from carrier.

3) Clamp assembly in soft-jawed vise. Remove differential side bearings with a suitable puller. Mark differential case halves for reassembly reference. Remove bolts and separate case halves. Remove side gears, spider, pinion gears, and thrust washers. Rotate carrier to provide access to pinion flange. Remove pinion flange. Remove oil seal retainer and pinion bearing retainer. Use only puller screws to remove bearing retainer; the use of pry bars will damage shims and driving the assembly out from the inside will damage bearings and locking devices.

4) With a micrometer, measure thickness of shims that were between bearing retainer and differential carrier. Record this reading and save shims for use later. Press pinion out of front pinion bearing and bearing retainer. Press rear bearing and spacer off pinion shaft. With a micrometer, measure pinion bearing spacer thickness and record reading. Remove snap ring that retains pilot bearing on rear end of pinion shaft, then press pilot bearing off shaft. If pinion bearing cups are to be replaced, press them out of pinion bearing retainer.

REASSEMBLY & ADJUSTMENT

1) Press pinion pilot bearing on pinion shaft (with large chamfer on inner race toward pinion teeth). Install snap ring. Press pinion rear bearing onto shaft so that it seats against back of pinion gear. Press pinion bearing cups into bearing retainer. Install pinion into bearing retainer.

2) Install original spacer and front pinion bearing. Do not install oil seal retainer. Install pinion flange and nut, then torque nut to specifications. Clamp bearing retainer into soft-jawed vise. Using an INCH Lbs. torque wrench, measure rotating torque of pinion shaft (see specifications). If rotating torque is too high, disassemble and use larger thickness spacer; if too low, use thinner spacer. Ignore torque needed to start shaft rotating; record only torque needed to keep shaft rotating.

3) After pinion bearing preload is adjusted, install a new oil seal. Install gasket between bearing retainer and oil seal retainer. Install flange. If pinion and ring gear are being changed, a new shim pack will be needed. If the old pinion and ring gear are being reused, use the original shim pack and go to step **4)**. To calculate thickness of new shim pack proceed as follows: On the machined head of pinion is a number preceeded by a plus or minus sign. This is the adjustment figure that will be referred to later. Start with thickness of original shim pack. If adjustment figure on OLD pinion is negative, ADD that amount to original shim pack. If adjustment figure on OLD pinion is positive, SUBTRACT that amount from original shim pack. Check the figure on the NEW pinion.

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If figure is positive, add that amount to shim pack; if figure is negative, subtract it. This will give you thickness of replacement shim pack.

Typical Shim Pack Calculations

Original Shim Pack Thickness	.060"
Old Pinion Adjustment Figure Is Negative (-15)	
Add Amount	+.015"
Intermediate Total	=.075"
New Pinion Adjustment Figure is Positive (+7)	
Add Amount	+.007"
Replacement Shim Pack Thickness	=.082"

NOTE — Shim pack should consist of at least three shims, one of which should be thin. Install the thinnest shim next to carrier.

4) Install pinion and retainer assembly in carrier housing using correct shims. Install attaching hardware and torque to specifications. Apply a coating of rear axle lubricant to differential components, then assemble them into ring gear half of differential case. Install other half of case making sure it is aligned in original position. Install and tighten bolts, then install locking wire. Install differential assembly into carrier.

5) Mesh ring and pinion gears with a slight amount of backlash. Set differential side bearing adjusters into place so that they just contact bearing cups. Install bearing caps in their original positions. Install bearing cap bolts and tighten while checking adjusters for freedom of movement. With bolts tightened to specifications, adjusters should turn easily. Alternately tighten bearing adjusters until there is some backlash between ring gear and pinion, and some preload on bearings. While bearings are preloaded, rotate ring gear several turns in each direction to seat bearing rollers in their cups. This is an important step.

6) Loosen adjusters until they are clear of bearing cups, then tighten them until they just touch bearing cups. Install a dial indicator on carrier housing with button against back face of ring gear. Adjust differential end play to zero without preloading side bearings. With end play at zero and preload condition zero, tighten each adjuster one notch. Measure ring gear back lash at four equally spaced points around ring gear. Adjust backlash to specifications by moving adjusters, but always move adjusters equal amounts; If one adjuster is tightened one notch, the other must be loosened one notch. The final adjustment on an adjuster must always be in a tightening direction. If adjuster has to be loosened one notch, loosen it two notches, then tighten it one notch. *NOTE — On Rockwell axles the ring gear will be etched on outer edge with the letter "BL", followed by a number (Ex. BL .010). That number is the ideal backlash setting for that particular pinion and ring gear set. However, backlash setting does not have to be exactly that, so long as it is within specifications.*

7) With backlash properly set, check gear tooth contact pattern. See *Rear Axle Gear Tooth Patterns at beginning of this section.* If equipped with thrust block and screw, tighten screw until block just touches ring gear. Then back off screw at least 1/6 turn, but no more than 1/4 turn. Tighten lock nut while holding screw in position. Install oil distributor components if so equipped. Install a dry gasket onto axle housing. Using a roller jack, install differential carrier into axle housing. Install four bolts and tighten evenly to draw carrier squarely into position. Install remaining bolts and tighten all to specifications. Install axles, connect drive shaft, and fill differential with proper lubricant.

TIGHTENING SPECIFICATIONS

Bolt Diameter	Ft. Lbs.
3/8"	40
7/16"	65
1/2"	100
9/16"	140
5/8"	200
3/4"	350
7/8"	550

NOTE — Values listed are for threads coated with engine oil. For dry threads, add 10%.

AXLE ASSEMBLY SPECIFICATIONS

Ring Gear Backlash	.005-.015"
Pinion Bearing Preload	5-15 INCH Lbs.
Maximum Ring Gear Runout	.008"