FORD MOTOR CO. SEPARATE HOUSING

Bronco
E-100 & E-150
F-100 & F-150

DESCRIPTION

The axle has a banjo-type housing with a removeable carrier. The drive pinion is straddle mounted, and its depth is adjusted by shims. The ring gear and differential case are mounted on the removeable carrier. The pre-load on the side bearings is set by adjusting nuts on which the bearing cups rest. This unit is distinguishable from the Dana/Spicer units by its removeable carrier and lack of a rear cover plate. It is used with semi-floating axles in all applications.

AXLE RATIO & IDENTIFICATION

Axle ratio and model identification numbers may be found on metal tag attached to axle by one carrier-to-housing bolt. Other information included on tag includes; date code, ring gear diameter, and assembly plant code.

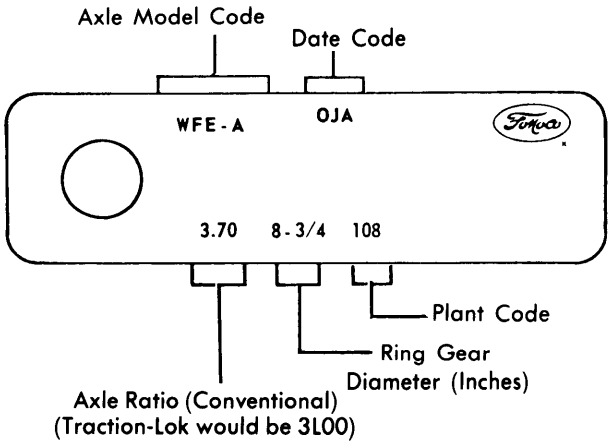

Fig. 1 Drive Axle Identification Tag With Explanation

REMOVAL & INSTALLATION

AXLE SHAFTS

Models W/Ball Type Bearing – Remove wheel and tire, and brake drum. Working through hole in axle flange, remove four wheel bearing retainer nuts. Using a slide hammer connected to axle, pull out axle and bearing. Install one nut to hold backing plate in place. To install, reverse removal procedure. Use new bearing retainer gasket. Make sure bearing is firmly seated in axle housing.

Models W/Tapered Roller Bearing – Follow same procedure as outlined for ball bearing removal. Use a slide hammer to remove bearing cup from axle housing. To install, reverse removal procedure. Place bearing cup over tapered bearing before sliding axle into housing.

AXLE BEARINGS & SEALS

Models W/Ball Type Bearing – With axle removed, nick bearing retainer with a chisel to loosen it for removal. Press or pull bearing from axle shaft after bearing retainer is removed. Remove axle seal using a slide hammer and a suitable adapter that will grip inside of seal. Install new bearing and retainer onto axle shaft. *NOTE – Do not attempt to press bearing and retaining ring onto axle at same time.* Install a new oil seal in housing using a suitable driver.

Models W/Tapered Roller Bearing – 1) With axle removed, drill a 1/4" hole in bearing retainer ring. Drill hole to a depth 3/4 of retainer ring thickness. Do not drill through ring into axle shaft. Place a chisel across drilled hole, strike with a hammer until ring separates and remove retaining ring. Remove bearing cup from axle housing and place over bearing. Position a suitable remover collet (T75L-1165-A) over bearing. Place axle shaft in a press positioned over a support plate and press off bearing.

2) Install retainer plate on axle shaft (if removed). Lubricate new seal and bearing, and position on axle shaft making sure cup rib ring faces axle flange. Press bearing into position on axle making sure bearing is fully seated. Do not attempt to press bearing retainer on at same time. Press on new bearing retainer.

PINION FLANGE & SEAL

NOTE – Solid spacer is used on vehicles with 390" V8 and manual transmission; collapsible spacer is used on all other applications.

Removal – Mark propeller shaft end yoke and pinion flange for reassembly reference, then disconnect propeller shaft and tie out of way. Scribe marks on pinion shaft and pinion flange for reassembly reference, then measure and record pinion bearing preload. Remove pinion nut, washer and flange, then pry pinion oil seal from bore in bearing retainer.

Installation (Differential with Collapsible Spacer) – Press new oil seal into bore in bearing retainer and seal outer edge with oil resistant sealer. Install pinion flange, washer and new nut. Tighten pinion shaft nut slowly while rotating pinion flange to insure proper seating of pinion bearings. Continue tightening nut, taking frequent preload readings. If recorded preload reading was less than specification, tighten to specification. If recorded reading was more than specification, tighten to original reading. *CAUTION – Do not back off pinion nut to lessen preload. If this is done a new spacer must be installed.* Install propeller shaft.

Installation (Differential with Solid Spacer) – Press new oil seal into bore in bearing retainer and seal outer edge with oil resistant sealer. Install pinion flange, washer and new nut. Tighten pinion shaft nut slowly while rotating pinion flange to insure proper seating of pinion bearings. Continue tightening nut to 180-200 ft. lbs. Install propeller shaft.

DIFFERENTIAL CARRIER

Remove both axle shafts, then mark propeller shaft end yoke and pinion flange for reassembly reference and remove propeller shaft. Drain rear axle lubricant, then remove carrier attaching bolts and differential carrier. To install, reverse removal procedure.

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FORD MOTOR CO. SEPARATE HOUSING (Cont.)

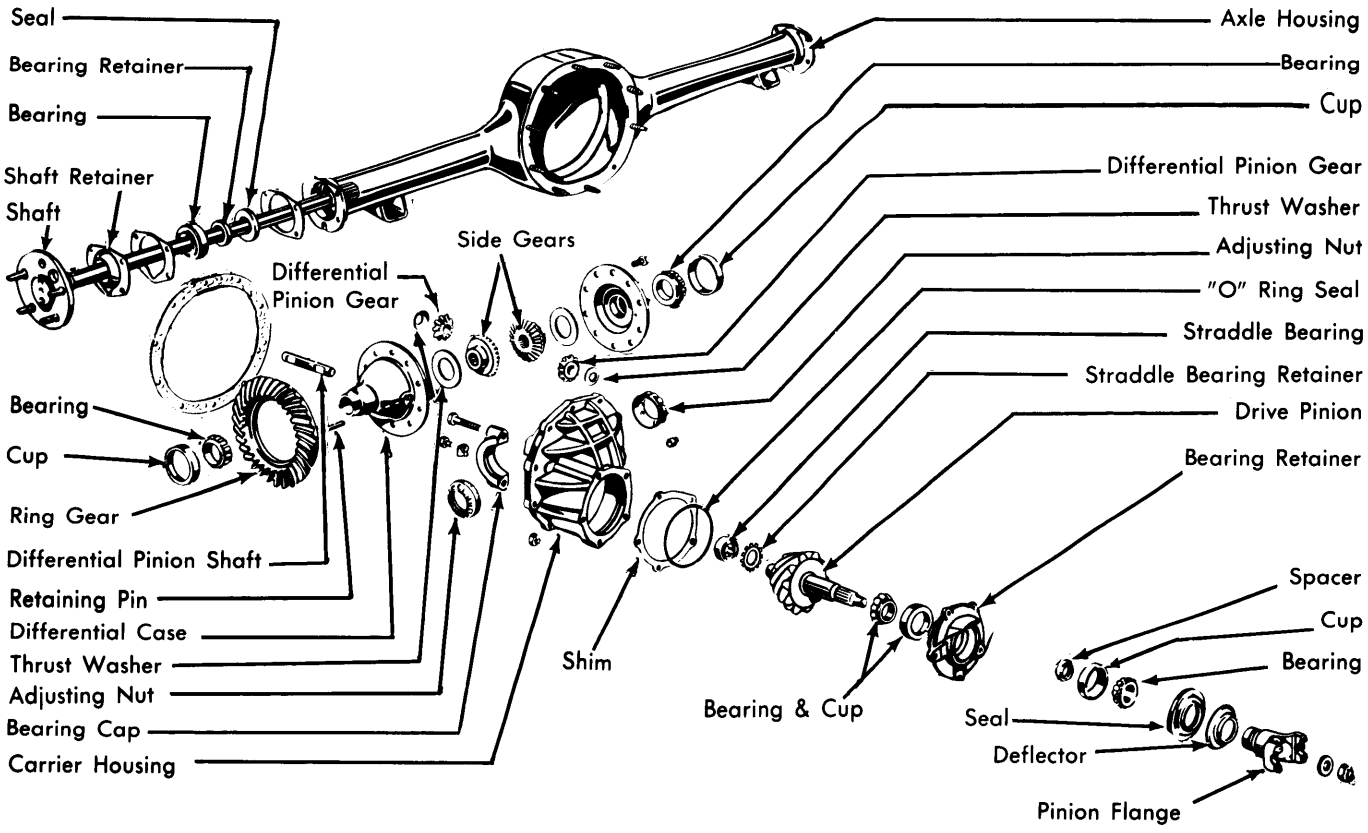

Fig. 2 Exploded View of Ford Motor Co. Separate Housing Axle Assembly

OVERHAUL

DISASSEMBLY

1) Mark differential bearing caps for reassembly reference, then remove adjusting nut locks, bearing caps and adjusting nuts. Remove differential case from carrier. Remove differential side bearings from case. Remove ring gear attaching bolts and tap ring gear from case using soft face hammer.

2) Drive out differential pinion shaft retaining pin. Mark case halves for reassembly reference and separate case. Using brass drift, drive out pinion shaft. Remove differential side gears, pinion gears and thrust washers from case.

3) Remove pinion shaft nut, washer, pinion flange and seal from carrier. Remove pinion shaft and bearing retainer, noting number and thickness of shims between retainer and carrier. Remove straddle bearing and retainer from carrier using suitable driver and press pinion bearings from pinion shaft. Press bearing cups from bearing retainer.

REASSEMBLY & ADJUSTMENT

NOTE – Lubricate all parts with hypoid gear lubricant during assembly.

Differential Case Assembly – Place differential side gear and thrust washer into differential case bore. From outside of case, drive differential pinion shaft into case just far enough to retain pinion thrust washer and pinion gear, then place second pinion thrust washer and gear into position in case. Drive pinion shaft into place, making sure shaft retainer holes are in alignment with holes in case. Install second side gear and thrust washer, assemble case halves and install retainer pin. Install differential side bearings and ring gear and tighten ring gear bolts.

Drive Pinion Depth – 1) Press new pinion bearing cups into bearing retainer until fully seated. Install straddle bearing into bore in carrier, then install NEW straddle bearing retainer in carrier and fully seat bearing and retainer. Press rear pinion bearing onto pinion shaft.

2) Determine pinion shim thickness as follows: If same ring, pinion and axle housing being reused, intall shim pack of same thickness as originally used. If new components being used, install "nominal" thickness shim and make tooth contact pattern check to determine further shim requirements.

NOTE – Solid spacer is used on vehicles with 390" V8 and manual transmission; collapsible spacer is used on all other applications.

Pinion Bearing Preload (W/Collapsible Preload Spacer) – 1) Place NEW preload spacer on drive pinion shaft. Install front pinion bearing and bearing retainer. Press bearing into position being careful not to crush spacer. Install "O" ring in groove in bearing retainer, place selected pinion depth shim on carrier housing, then install pinion assembly and tighten bolts.

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FORD MOTOR CO. SEPARATE HOUSING (Cont.)

2) Install pinion flange, washer and nut. Tighten pinion flange nut to 175 ft. lbs. *NOTE – Do not exceed 175 ft. lbs. at this time.* Check pinion bearing preload. Continue to tighten pinion flange nut until proper preload is obtained. *CAUTION – Do not overtighten nut.* If excessive preload is obtained as a result of overtightening, replace collapsible spacer. *CAUTION – Do not back off nut to obtain preload. If torque on pinion shaft is less than 175 ft. lbs. after preload is established, a new collapsible spacer MUST be installed.*

Pinion Bearing Preload (W/Solid Preload Spacer) – 1) Place thickest available preload spacer against rear bearing on pinion shaft. *NOTE – Thickest spacer must be tried first because bearing preload can be measured accurately only when pinion nut is fully tightened. If smaller spacer used first, high torque on pinion nut will damage bearings.* Install front pinion bearing and bearing retainer on pinion shaft and place assembly in suitable holding fixture.

2) Install pinion flange and OLD pinion flange washer and nut. Tighten nut to 180-220 ft. lbs. while rotating pinion gear. Note beginning of slight drag on gear which indicates preload. If bearing drag indicates a preload condition, attach an INCH Lb. torque wrench to pinion nut. Measure torque required to turn shaft. If preload is as specified, proceed to step 4). If preload is less than specification, select the correct size spacer from Spacer Selection Chart (From Preload Measurement).

Spacer Selection Chart (From Preload Measurement)

Preload	Spacer Size
2-11	.482"
12-20	.483"
21-30	.484"
31-45	.485"

3) If there was no preload felt or measured, spacer size can be determined by checking end play. Mount a dial indicator on bearing retainer with indicator stem contacting end of pinion gear shaft. Using both hands, squeeze bearing retainer and pinion gear together and measure end play. Using measured end play, select the correct spacer from Spacer Selection Chart (From End Play Measurement).

Spacer Selection Chart (From End Play Measurement)

End Play	Spacer Size
.000	.481"
.0001"	.480"
.0002"	.479"
.0003-.0004"	.478"
.0005-.0006"	.474"
.0008-.0009"	.472"
.001-.0011"	.470"
.0012-.0013"	.468"
.0014"	.466"
.0015"	.465"

4) With preload correct or proper spacer size selected, remove old pinion nut and washer. If necessary, install new, correct size spacer. Position front bearing retainer and cup on shaft and install front bearing cone and press front cone and roller into position. Lubricate new "O" ring with axle lubricant and install in groove in pinion retainer. Care must be taken not to twist "O" ring.

5) Position proper shim (previously determined) on carrier housing and place pinion and retainer in carrier. Care must be taken not to pinch "O" ring. Install and tighten retainer bolts. Place slinger on pinion shaft against bearing. Install a new seal in bearing retainer. Place flange over pinion shaft and start new integral nut and washer. Hold flange and tighten pinion nut to specification.

Backlash & Side Bearing Preload – 1) Place cups on differential side bearings and set differential case in carrier. Slide assembly along bores until a slight amount of backlash is felt between gear teeth. Set adjusting nuts in bores so nuts just contact bearing cups (each nut should be engaging approximately same number of threads). Carefully position bearing caps on carrier, install bearing cap bolts and tighten to 35 ft. lbs.

2) Loosen right adjusting nut until nut is away from cup. Tighten left adjusting nut until there is no backlash. Tighten right nut two notches past initial contact with cup, then rotate ring gear several revolutions in each direction to properly seat loaded bearings.

3) Loosen right adjusting nut and eliminate any existing backlash by tightening left adjusting nut. Carefully tighten right adjusting nut until it just contacts bearing cup. Install dial indicator in manner shown in illustration. Continue to tighten right nut to obtain correct case spread (see Side Bearing Preload in Specifications).

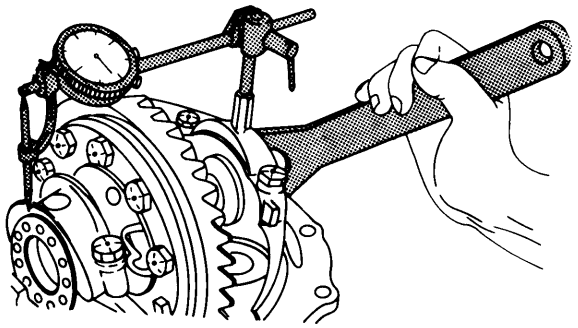

Fig. 3 Using Dial Indicator to Adjust Side Bearing Preload

4) Install dial indicator on carrier so contact tip of indicator bears against face of gear tooth on outer diameter of ring gear. Measure backlash at several locations around ring gear. If measurements vary more than .003", there is excessive runout in gear or mounting. If backlash not correct, loosen one adjusting nut and tighten opposite nut an equal amount to move ring gear into adjustment. *NOTE – When moving adjusting nuts, final movement should always be made in a tightening direction. If nut must be loosened one notch, loosen nut two notches and tighten it one notch.*

5) When side bearing preload and ring gear backlash are properly set, tighten side bearing caps to specifications. Make gear tooth pattern check (see appropriate article in this Section), and install carrier into axle housing.

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FORD MOTOR CO. SEPARATE HOUSING (Cont.)

TIGHTENING SPECIFICATIONS

Application	Torque (Ft. Lbs.)
Side Bearing Cap Bolts	70-80
Ring Gear Bolts	60-80
Pinion Flange Nut	
Collapsible Spacer (Minimum)	175
Solid Spacer	180-220
Pinion Bearing Retainer-to-Carrier	30-45
Carrier-to-Housing	30-40
Adjusting Nut Lock Bolts	12-15

AXLE ASSEMBLY SPECIFICATIONS

Application	Specification
Ring Gear Backlash	.008-.012"
Ring Gear Runout (Maximum)	.003"
Backlash Variation (Maximum)	.003"
Side Bearing Preload (Case Spread)	
New Bearings	.008-.012"
Used Bearings	.005-.008"
Pinion Bearing Preload (Rotating Torque)	
Solid Spacer	12.5-32.5 INCH Lbs.
Collapsible Spacer	
New Bearings	22-32 INCH Lbs.
Used Bearings	10-14 INCH Lbs.
Side Gear Thrust Washer Thickness	.030-.032"
Pinion Gear Thrust Washer Thickness	.030-.032"
Nominal Pinion Shim Thickness	.015"

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