Drive Axles

FIAT SPIDER 2000

DESCRIPTION

Rear axle assembly uses an integral carrier type differential having a hypoid type ring and drive pinion gear set.

Drive pinion bearing preload is maintained by a collapsible spacer. Differential bearing preload is obtained through the use of shims between the bearings and rear axle housing.

Semi-floating axles use ball bearings retained on the axle by a press fit retaining ring and the axle is secured in the housing with a retaining flange. A removable rear cover permits inspection and service of differential assembly.

AXLE RATIO & IDENTIFICATION

Fiat uses 2 axle ratios. The manual transmission model uses a 3.90:1 gear ratio, 10 tooth pinion and 39 tooth ring gear. The automatic transmission model uses a 3.58:1 gear ratio, 12 tooth pinion and 43 tooth ring gear.

REMOVAL & INSTALLATION

AXLE SHAFTS & BEARINGS

Removal

1) Raise and support vehicle. Remove rear wheels. Remove brake calipers and disc. Working through a large hole in axle shaft flange, remove bolts and lock washers holding retaining plate to axle.

2) Attach slide hammer to axle flange and pull axle from housing using care to guide the brake backing plate off the axle as it is extracted.

3) Remove axle bearing from shaft using an arbor press and support. Discard axle shaft bearing retainer. Inspect retainer seat on axle shaft and if seat is scored or damaged, replace axle shaft.

Installation

1) Install retainer flange, bearing, and retaining ring on axle shaft.

2) Using an arbor press and appropriate support tools, press bearing retainer onto shaft until bearing is locked between retainer and shoulder on axle shaft.

NOTE: Do not exceed 13,000 lbs. (57,824 N) force with press, as damage to axle shaft assembly may occur.

3) If axle is to be installed at this time, replace oil seal inside axle housing (if required), and install axle in reverse order of removal.

REAR AXLE ASSEMBLY

Removal

1) Raise and support vehicle. Remove rear wheels and disconnect brake system components.

2) Disconnect brake hose from "T" connector. Remove bolt, washers and nut holding link for brake compensator to bracket. Disconnect hand brake cable from both calipers.

Installation

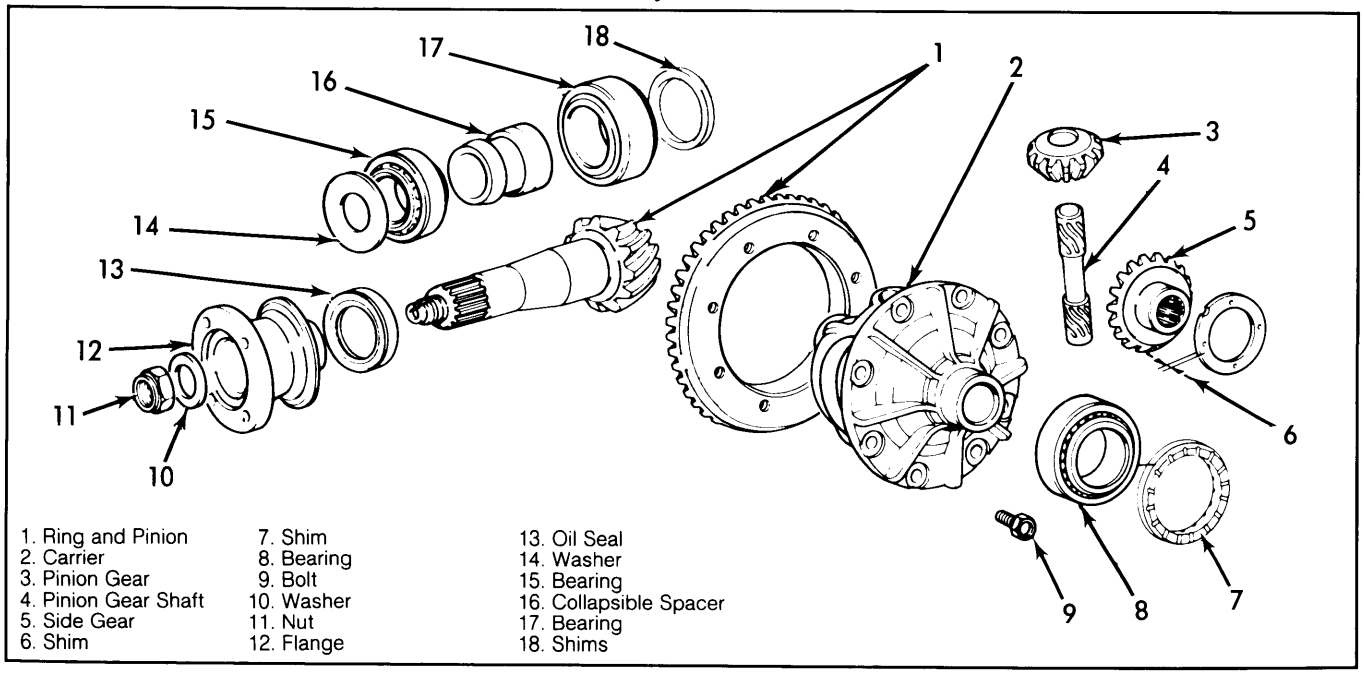
Reverse removal procedure then bleed the brake system and check for proper operation of parking brake.

OVERHAUL

DISASSEMBLY

NOTE: Overhaul of differential assembly can be accomplished with rear axle assembly installed in vehicle.

Fig. 1: Exploded View of Spider 2000 Differential Assembly



1. Ring and Pinion
2. Carrier
3. Pinion Gear
4. Pinion Gear Shaft
5. Side Gear
6. Shim
7. Shim
8. Bearing
9. Bolt
10. Washer
11. Nut
12. Flange
13. Oil Seal
14. Washer
15. Bearing
16. Collapsible Spacer
17. Bearing
18. Shims

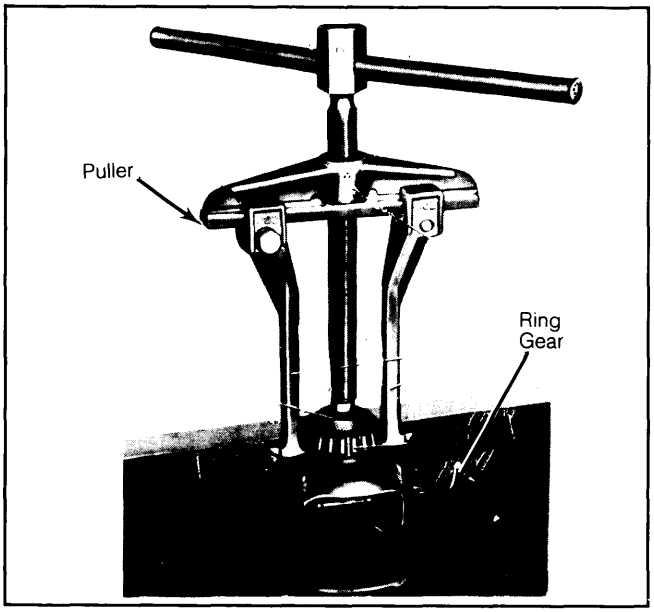
FIAT SPIDER 2000 (Cont.)

Differential Case Assembly

1) Raise and support vehicle, remove axle shafts as previously described and separate propeller shaft from drive pinion flange. Drain lubricant from housing and remove rear housing cover.

NOTE: Before disassembling the following checks should be made and recorded. Ring gear backlash and runout, and a tooth pattern check.

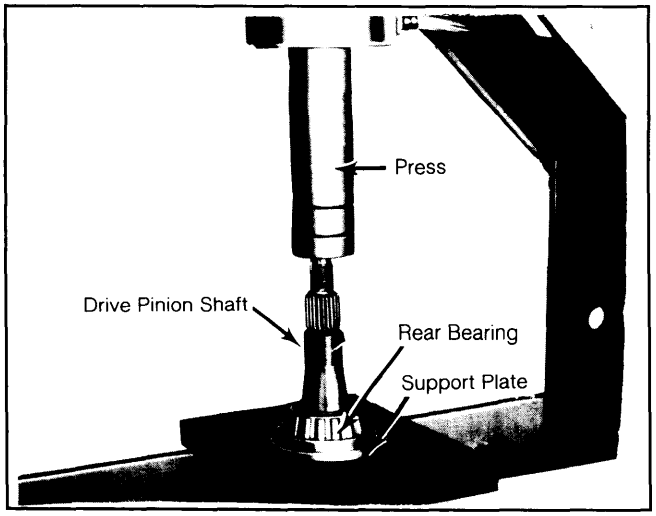
Fig. 2: Removing Differential Bearings from Case



Keep bearings and shims in order for reassembly.

2) Mark differential bearing caps for reference at time of reassembly. Remove bearing caps. Install case spreader tool on housing. Spread housing and remove differential case along with bearings and shims, noting position of bearing outer race and shims and keeping all left and right side components separated.

Fig. 3: Removing Rear Bearing from Drive Pinion Gear



Keep shims found between bearing and gear for later use.

3) Using a puller, remove differential bearings from case. Keep bearings separated with other components. Put locating reference marks on ring gear and case, then remove eight ring gear-to-case retaining bolts and remove ring gear.

4) Using a soft drift, drive differential pinion gear shaft out of case. Remove pinion gears, side gears, and side gear thrust washers.

Drive Pinion Gear

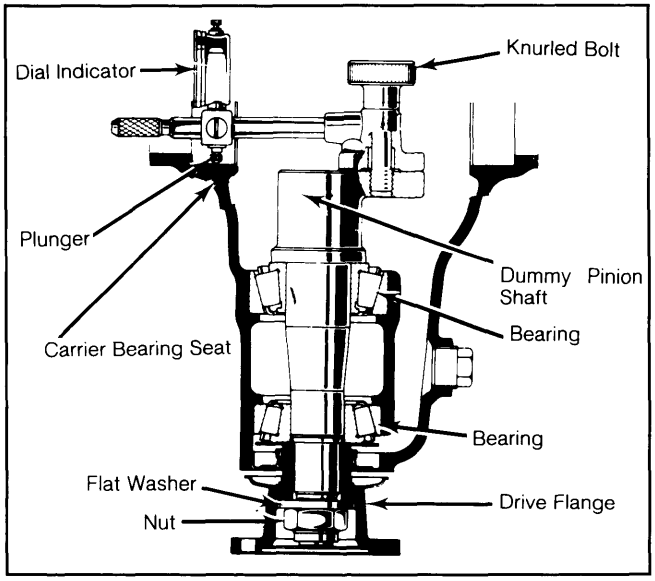
Hold drive pinion flange and remove flange nut and flange from drive pinion gear. Remove oil seal and dust shield from pinion shaft then push drive pinion gear out rear of housing. Remove drive pinion bearing outer races from housing. Using an arbor press, remove rear bearing from drive pinion shaft and retain shims found between bearing and gear.

REASSEMBLY & ADJUSTMENT

Pinion Depth

1) Install pinion bearing outer races in rear axle housing. Before installing rear bearing on drive pinion gear, establish pinion depth adjusting shim thickness as follows.

Fig. 4: Determining Shim Thickness



Zero dial indicator on flat surface of dummy pinion shaft.

2) Install dummy pinion shaft with front and rear bearings installed. Install flange, flat washer, and nut. Tighten nut while rotating dummy pinion.

3) Install dial indicator on dummy pinion shaft with plunger on carrier bearing seat. Tighten knurled bolt. Note reading on dial indicator. Using markings on new pinion shaft, determine size of shim necessary to obtain proper pinion depth.

4) If marking on pinion is proceeded by a plus (+), subtract from dial indicator reading to obtain shim thickness. If marking is proceeded by a minus (—), add this number to dial indicator reading to obtain shim thickness. Shims are available from 2.55 mm to 3.35 mm in graduations of 0.5 mm.

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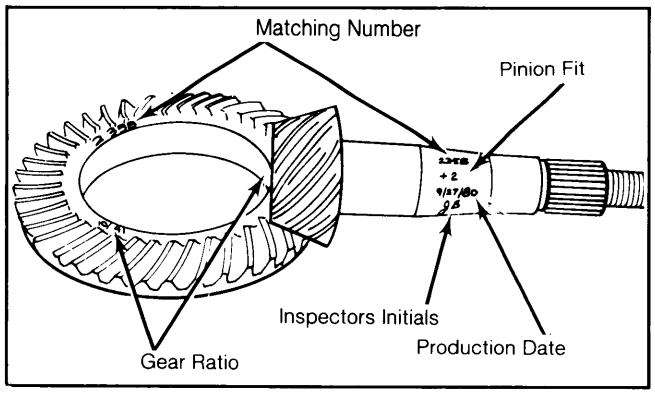
Fig. 5: Ring and Pinion Gear Markings



5) If "A" is dial indicator reading and "B" is factory marking (in hundredths of a millimeter), then "S" the thickness of the shims is determined by using the following formula.

S = A — (+B) = A — B
or
S = A — (—B) = A + B

EXAMPLE: If indicator reading "A" is 2.90 and marking on pinion "B" is —5 then shim thickness "S" is 2.90 — (—0.05) or 2.95.

NOTE: If the original ring and pinion gears will be used for reassembly, and ring-to-drive pinion gear tooth contact pattern is satisfactory, use original shim(s).

6) Place new (or original) pinion depth adjusting shim on drive pinion gear. Press rear bearing on drive pinion gear. Lubricate bearing and install drive pinion and bearing in housing. Install new collapsible spacer, front pinion bearing, dust shield, new oil seal and pinion flange in housing.

7) Start pinion flange nut on shaft and as nut is tightened, keep checking rotating torque of pinion shaft (pinion bearing preload) using an INCH pound torque wrench. Tighten nut until pinion bearing preload is within specifications.

NOTE: If pinion bearing preload torque is exceeded, do not back off nut to obtain preload. Install new collapsible spacer and repeat procedure.

Differential Case Assembly

1) Place thrust washers on side gears and install side gears in case. Install pinion gears by rolling them into position and install pinion shaft.

2) Check rotating torque of one side gear while holding the other. If torque is not to specification, install new thrust washers on side gears.

NOTE: Thrust washers are available in thicknesses from .0709" (1.80 mm) to .0817" (2.10 mm) in increments of .002" (.05 mm).

3) Install ring gear on case and tighten bolts to specified torque. Press differential bearings onto case, and if using original bearings, spread housing and install case using original shims.

4) If using new bearings or case, install case in housing and insert enough shims equally on both sides to eliminate any end play.

5) Install bearing caps and bolts and tighten bolts. Measure ring gear backlash using a dial indicator mounted to housing with plunger contacting ring gear at a right angle to the ring gear teeth.

6) Block drive pinion flange from turning. Zero dial indicator. Rotate ring gear back as far as possible and note backlash reading on indicator. If backlash is not within specification, adjust backlash by changing size of shims.

7) To increase backlash, increase size of shim on pinion side of carrier, and to decrease backlash, increase size of shim on ring gear side of carrier. When changing shims, be sure to install shims of equal size to opposite side of carrier.

8) After determining correct shims to be used, add .002" (.05 mm) more shim thickness to each side. Install spreader on housing, spread housing and install bearing outer races and shims.

9) Remove spreader and install bearing caps and tighten bolts. With differential completely assembled, check ring-to-pinion gear tooth contact pattern to ensure all adjustments are correct.

AXLE ASSEMBLY SPECIFICATIONS

Application	Specification
Pinion Bearing Preload	14-17 INCH Lbs. (1.5-1.9 N.m)
Ring Gear Backlash	.003-.005" (.08-.13 mm)
Side Gear Rotating Torque	22-36 Ft. Lbs. (30-49 N.m)
Differential Bearing Preload	[1] Slip Fit Plus .004" (.10 mm)

[1] — .002" (.05 mm) on each side of differential case.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Axle Shaft Retaining Flange Bolts	36 (49)
Cover-to-Housing Bolts	18 (24)
Differential Bearing Cap Bolts	36 (49)
Ring Gear-to-Case Bolts	72 (98)