IHC SEMI-FLOATING AXLES

International Harvester (1965-66)

NOTE — Some models use other units, see Dana/Spicer Semi-Floating or Dana/Spicer Full Floating Axles in this Section.

DESCRIPTION

Axle has banjo-type housing, hypoid gear differential with straddle mounted drive pinion, and removable carrier. It is available with Power-Lok, a locking differential. Axle shaft on semi-floating models carries part of vehicle weight as well as transmitting torque to wheel.

AXLE RATIO & IDENTIFICATION

Axle can be identified by code number on Part Code Sheet found in glove compartment and mounted on sun visor, or by corresponding model number found on metal tag on carrier bolt circle. Metal tag also identifies axle ratio.

Axle Identification

Code Number	Model Number	Axle Type
14005	RA-5	Semi-Floating
14006①	RA-6	Semi-Floating

① — Equipped with Power-Lok differential.

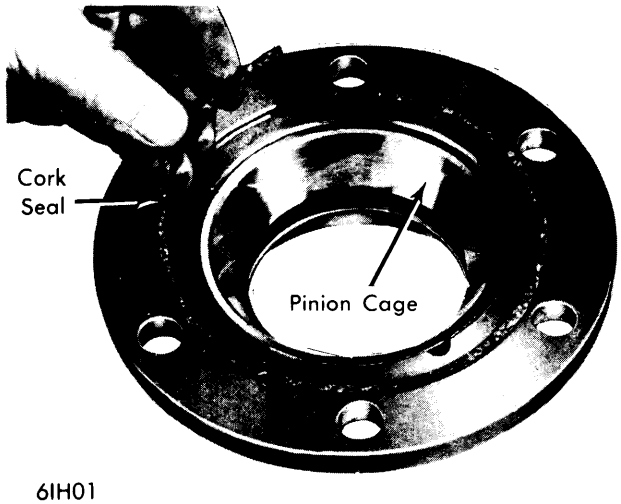
REMOVAL & INSTALLATION

WHEEL & HUB

Hub is keyed directly to tapered axle shaft. Use a suitable puller to remove hub and drum assembly.

AXLE SHAFTS & BEARINGS

Remove wheel and hub and drum assembly. Remove brake backing plate and bearing retainer. Pull axle from housing. Bearing is a press fit on tapered end of axle; use suitable puller to remove. To install, wipe tapered end clean with rag and snap bearing into place by hand. To install axle, reverse removal procedure.

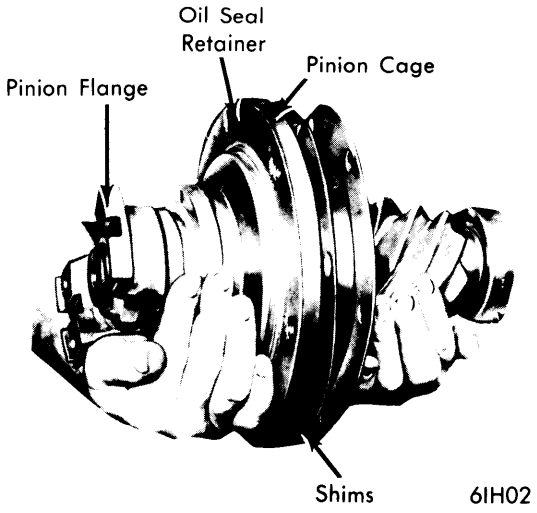


6IH01

REMOVING CAGE SEAL

PINION FLANGE & SEAL

Disconnect drive shaft. Holding pinion flange or yoke, remove pinion shaft nut and washer. Using a suitable puller, remove pinion flange. Remove pinion case bolts and slide off oil seal retainer without removing pinion cage. Remove and replace cork seal (see illustration). Remove and replace seals in seal retainer. To install, reverse removal procedure.



6IH02

PINION & CAGE ASSEMBLY

DIFFERENTIAL CARRIER

Remove propeller shaft and both axle shafts. Place a pan under axle to catch lubricant. Remove carrier attaching bolts and remove carrier. If carrier has threaded puller screw holes, puller screws can be used to initially loosen carrier from axle assembly. If carrier does not have threaded holes, a soft hammer can be used to jar carrier loose. To install, reverse removal procedure and tighten carrier attaching bolts.

OVERHAUL

NOTE — Overhaul for axles with Power-Lok is found in POSITIVE TRACTION DIFFERENTIALS in this section.

DISASSEMBLY

1) Remove cotter pins from bearing adjuster locks and remove locks from bearing caps (see illustration). Mark bearing caps so that they can be installed in their original positions. Remove nuts and remove bearing caps and adjusting nuts. Tip differential away from pinion and lift out of axle housing.

2) Remove side bearings from differential case with a suitable puller. On assemblies with two differential pinions, drive out differential pinion shaft retaining pin, then remove shaft, pinion gears, side gears, and thrust washers. On assemblies with four pinion gears, mark differential case halves with a punch for correct alignment during reassembly. Cut lock wire, remove

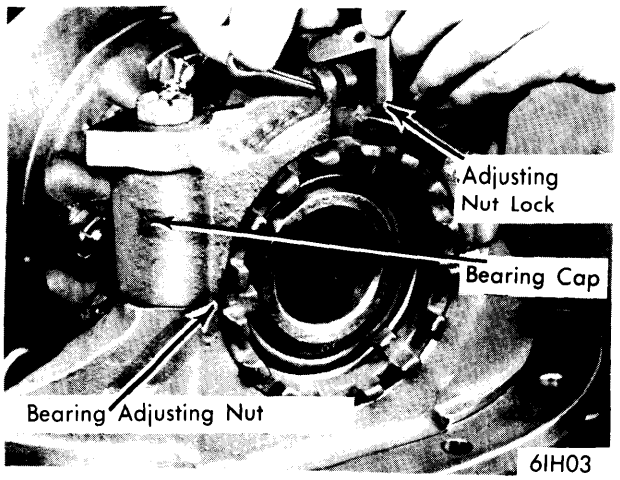
IHC SEMI-FLOATING AXLES (Cont.)

bolts, and separate case halves; remove spider, pinions, side gears, and thrust washers.

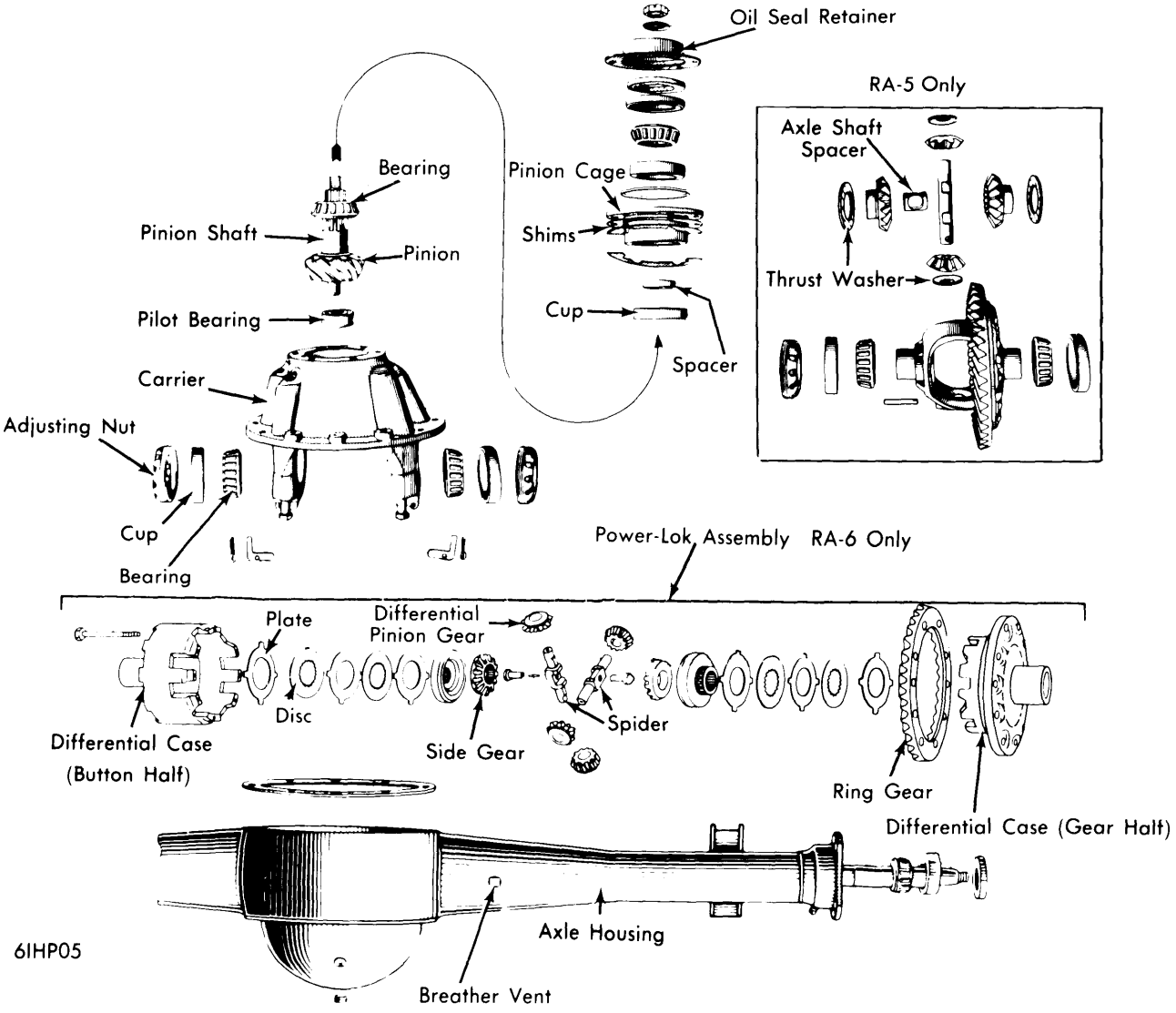
3) If it is necessary to remove ring gear from case, DO NOT cut rivet heads off with a chisel. Carefully center punch rivet head, then drill out head only with $^{13}/_{32}$" bit. Punch rivet out with drift pin (see illustration).

4) There are two methods for removing pinion and cage assembly. If there are no puller screw holes in pinion cage flange, remove pinion cage bolts and with a brass drift, tap machined end of pinion gear to drive pinion cage assembly out of rear of carrier. *CAUTION — Do not let cage assembly fall.*

5) If there are puller screw holes in pinion cage flange, hold pinion flange or yoke and remove pinion shaft nut and washer. Remove flange with suitable puller. Remove pinion cage bolts,



ADJUSTER LOCK REMOVAL

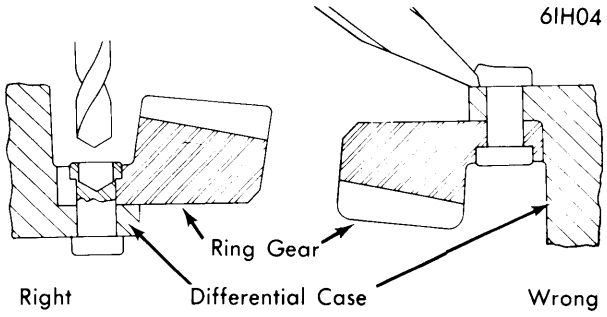


INTERNATIONAL HARVESTER SEPARATE HOUSING AXLE ASSEMBLY

IHC SEMI-FLOATING AXLES (Cont.)

bearing cover and oil seal assembly. Insert puller screws in cage flange and remove pinion and cage assembly. *CAUTION — If puller screw holes are provided, never use brass drift technique, for damage to bearing lock ring groove could result.*

6) If pinion flange or yoke has not been removed, mount pinion and cage assembly in vise and remove pinion shaft nut. Using a suitable puller, remove pinion flange. Using a brass drift, tap pinion shaft from yoke end to drive assembly out of cage. Disassemble pinion shaft assembly.



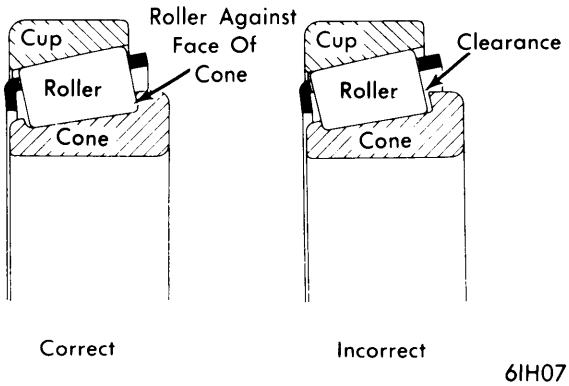
RING GEAR RIVET REMOVAL

REASSEMBLY & ADJUSTMENT

Case Assembly — 1) To assemble, reverse disassembly procedure noting the following: Examine side gear and differential pinion thrust washers for wear. If any wear is evident, replace. Make sure that case halves are assembled in their original position by noting marks made during disassembly.

2) Ring gear is installed by using suitable riveting jig (SE-1575) and specified riveting pressure. Ring gear and pinion must be installed as a set.

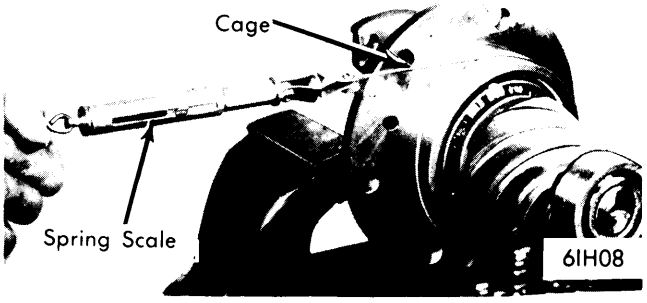
Pinion Depth & Bearing Preload — 1) Before pinion and ring gear can be adjusted for correct tooth contact, pinion bearing preload must be set. This is accomplished by selecting the correct size spacer, located between pinion thrust bearings, and tightening pinion shaft nut.



CORRECT BEARING ROLLER POSITION

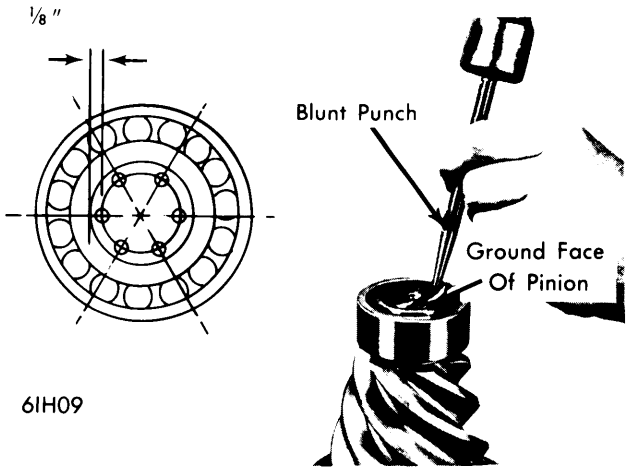
2) Temporarily bolt together pinion, cage, and pinion flange assembly, less oil seal and retainer. Clamp assembly in vise by the pinion flange, and tighten pinion shaft nut. Cage should be rotated while tightening shaft nut in order to properly seat bearings. Bearing rollers must be seated against face of bearing cone, and there must be no clearance at large end of bearing rollers (see illustration).

3) To measure preload, wrap a cord or soft wire around pinion cage and attach free end to spring scale (see illustration). Pull on scale and note tension after cage begins to move; ignore initial starting tension. If tension is not to specifications, adjust by replacing spacer with thicker or thinner spacer as required. A spacer that is close to dimension can be worked on emery cloth to necessary size. Be sure to wipe all filings from spacer before installing on shaft.



MEASURING PINION BEARING PRELOAD

4) If pilot bearing was removed from pinion shaft, it is replaced by pressing it onto end of shaft and staking it into position. Staking should be done with a blunt punch at six equidistant points 1/8" in from shaft outside diameter (see illustration).

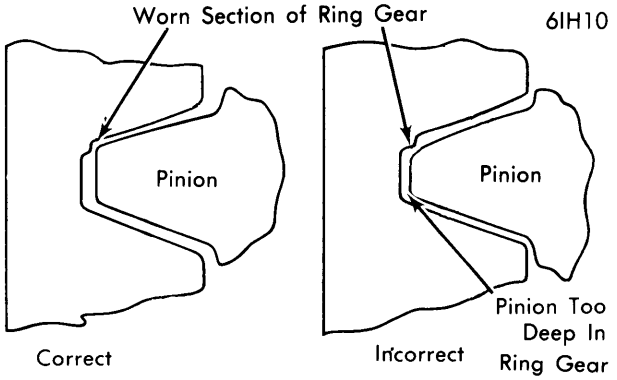


STAKING PINION PILOT BEARING

IHC SEMI-FLOATING AXLES (Cont.)

5) Install pinion, cage, and bearing assembly in differential carrier. Add or subtract, as indicated, correction figure etched on end of pinion gear to specified pinion gear depth. Using a suitable gauge or fixture, establish pinion gear depth, measuring from machined surface of pinion to center of ring gear. Increase or decrease shim thickness, as required, to obtain corrected pinion depth.

Backlash & Side Bearing Preload – 1) Install differential case assembly in carrier. Using a dial gauge, measure ring gear backlash. If backlash figure is not etched on ring gear, see specifications for proper tolerance. To adjust backlash, turn side bearing adjusting nuts to move ring gear either in or out.



PROPER WORN GEAR INSTALLATION

2) When original gear and pinion sets are being reinstalled, wear pattern of gear teeth must be considered. Gears that have been in service for long periods form running contacts which should not be greatly changed. If, in checking backlash, amount measured is in excess of amount specified, backlash may be reduced only by amount that will avoid overlap of worn tooth section. Any overlap of worn section will cause gear operation to be rough and noisy.

3) Mount dial indicator at side of ring gear. Loosen bearing caps only enough to allow slight bearing movement. Loosen adjusting nuts until slight bearing end play is indicated on dial indicator. Tighten adjusting nuts to reduce end play to zero, but no tighter. Rotate ring gear to check for runout. If runout exceeds .008", remove case and check for cause. Tighten bearing adjusting nuts specified number of notches to preload bearings, then tighten bearing cap bolts. Recheck backlash to insure that it has not changed during preload adjustment. Install adjusting nut locks.

4) Check gear tooth contact using paint impression method described in this section.

Final Assembly – *See Differential Carrier.*

RIVET PRESSURE

Application	Pressure (Tons)
Ring Gear	18-20

AXLE ASSEMBLY SPECIFICATIONS

Ring Gear Backlash	.004-.006"
Side Bearing Preload	1 Notch
Pinion Bearing Preload	3-8 Lbs.
Pinion Gear Depth	
RA-5 & RA-6	2.6094"
RA-15 & RA-20	2.9830"

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Pinion Shaft Nut	200-230
Pinion Cage To Carrier	30-40
Carrier-To-Housing	
RA-5 & RA-6	40-50
RA-15 & RA-20	80-90
Differential Case	40-50
Bearing Cap-To-Carrier	80-90
Axle Flange-To-Rear Hub	80-90

IHC FULL FLOATING AXLES

International Harvester (1965-74)

NOTE — Some models use other units, see Dana/Spicer Semi-Floating or Dana/Spicer Full Floating Axles in this Section.

DESCRIPTION

Axle has banjo-type housing, hypoid gear differential with straddle mounted drive pinion, and removable carrier. Axle shaft on full floating models carries none of the vehicle weight; it only transmits torque to the wheels. Vehicle weight is borne by axle housing.

AXLE RATIO & IDENTIFICATION

Axle can be identified by code number on Part Code Sheet found in glove compartment and mounted on sun visor, or by corresponding model number found on metal tag on carrier bolt circle. Metal tag also identifies axle ratio.

Axle Identification

Code Number	Model Number	Axle Type
14015	RA-15	Full Floating
14020	RA-20	Full Floating

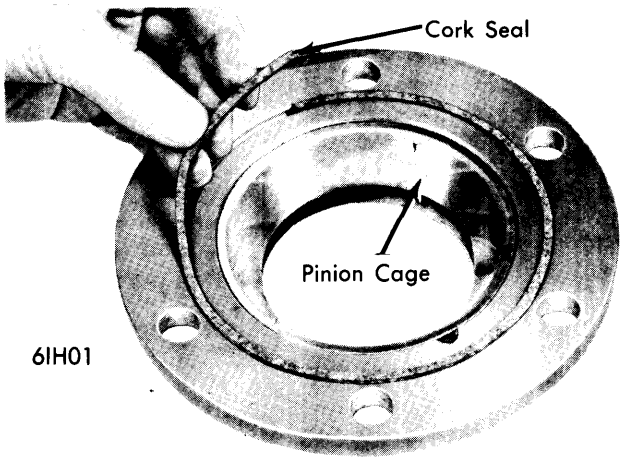
REMOVAL & INSTALLATION

WHEEL & HUB

Remove wheel. Remove flange nuts and lock washers. Using pulling screws in threaded flange holes, pull flange and axle away from hub. Bend tab on lock nut lock washer and remove lock nut, lock washer, thrust washer, and bearing. Remove hub. To install, reverse removal procedure.

AXLE SHAFTS & BEARINGS

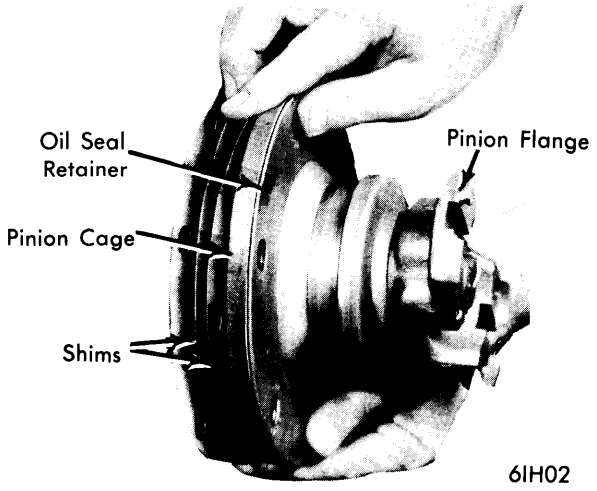
Remove axle. See *Wheel & Hub*. Bearing adjustment is made by nut at outer wheel bearing. Tighten nut to 50 ft. lbs. and rotate wheel to insure that bearing is properly seated and not binding. Back nut off ¼ turn and install jam (lock) nut; torque jam nut to 150 ft. lbs. without changing adjusting nut setting. Bend tabs on washer to secure adjustment.



REMOVING CAGE SEAL

PINION FLANGE & SEAL

Disconnect drive shaft. Holding pinion flange or yoke, remove pinion shaft nut and washer. Using a suitable puller, remove pinion flange. Remove pinion case bolts and slide off oil seal retainer without removing pinion cage. Remove and replace cork seal (see illustration). Remove and replace seals in seal retainer. To install, reverse removal procedure.



PINION & CAGE ASSEMBLY

DIFFERENTIAL CARRIER

Remove propeller shaft and both axle shafts. Place a pan under axle to catch lubricant. Remove carrier attaching bolts and remove carrier. If carrier has threaded puller screw holes, puller screws can be used to initially loosen carrier from axle assembly. If carrier does not have threaded holes, a soft hammer can be used to jar carrier loose. To install, reverse removal procedure and tighten carrier attaching bolts.

OVERHAUL

DISASSEMBLY

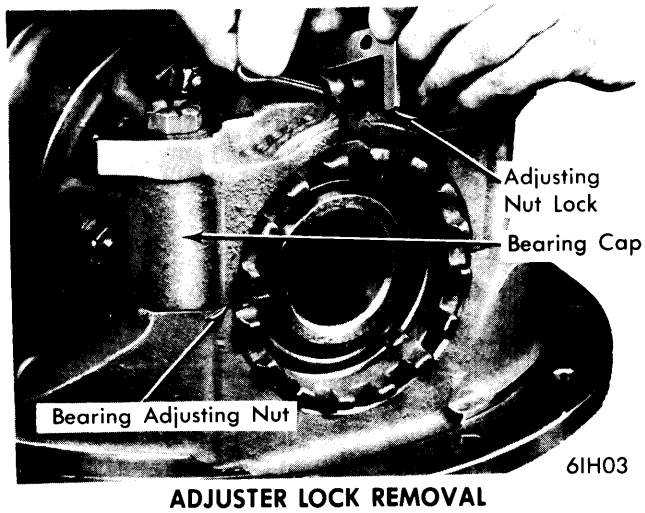
1) Remove cotter pins from bearing adjuster locks and remove locks from bearing caps (see illustration). Mark bearing caps so that they can be installed in their original positions. Remove nuts and remove bearing caps and adjusting nuts. Tip differential away from pinion and lift out of axle housing.

2) Remove side bearings from differential case with a suitable puller. On assemblies with two differential pinions, drive out differential pinion shaft retaining pin, then remove shaft, pinion gears, side gears, and thrust washers. On assemblies with four pinion gears, mark differential case halves with a punch for correct alignment during reassembly. Cut lock wire, remove bolts, and separate case halves; remove spider, pinions, side gears, and thrust washers.

3) If it is necessary to remove ring gear from case, DO NOT cut rivet heads off with a chisel. Carefully center punch rivet head, then drill out head only with $^{13}/_{32}$" bit. Punch rivet out with drift pin (see illustration).

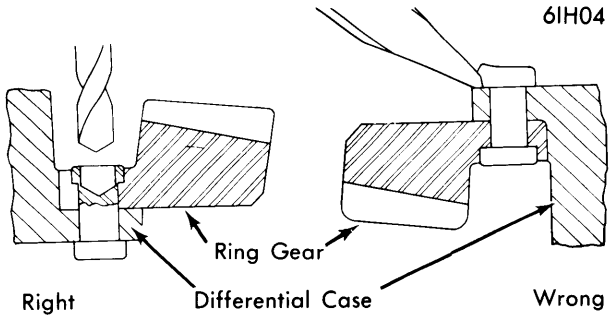
IHC FULL FLOATING AXLES (Cont.)

4) There are two methods for removing pinion and cage assembly. If there are no puller screw holes in pinion cage flange, remove pinion cage bolts and with a brass drift, tap machined end of pinion gear to drive pinion cage assembly out of rear of carrier. *CAUTION — Do not let cage assembly fall.*



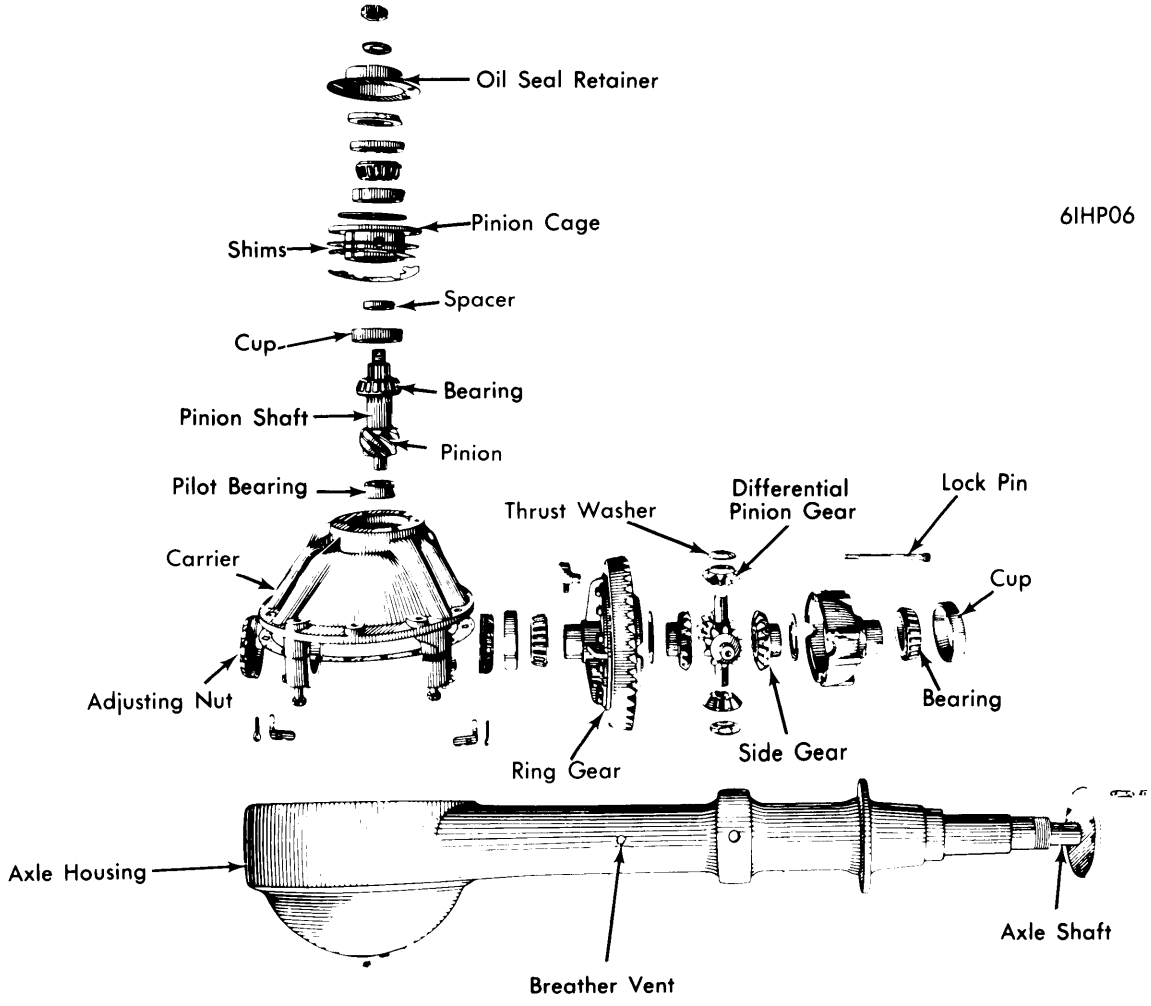
ADJUSTER LOCK REMOVAL

5) If there are puller screw holes in pinion cage flange, hold pinion flange or yoke and remove pinion shaft nut and washer. Remove flange with suitable puller. Remove pinion cage bolts, bearing cover and oil seal assembly. Insert puller screws in cage flange and remove pinion and cage assembly. *CAUTION — If puller screw holes are provided, never use brass drift technique, for damage to bearing lock ring groove could result.*



RING GEAR RIVET REMOVAL

6) If pinion flange or yoke has not been removed, mount pinion and cage assembly in vise and remove pinion shaft nut. Using a suitable puller, remove pinion flange. Using a brass drift, tap pinion shaft from yoke end to drive assembly out of cage. Disassemble pinion shaft assembly.



INTERNATIONAL HARVESTER SEPARATE HOUSING AXLE ASSEMBLY

IHC FULL FLOATING AXLES (Cont.)

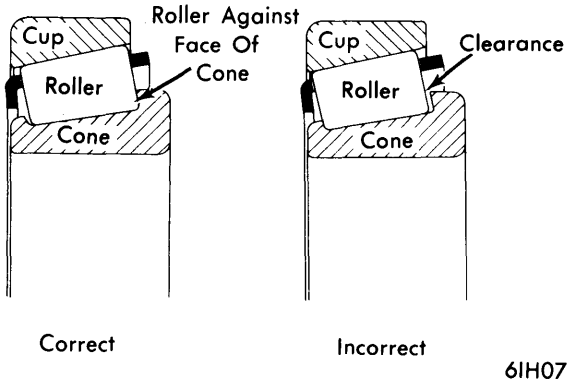
REASSEMBLY & ADJUSTMENT

Case Assembly – 1) To assemble, reverse disassembly procedure noting the following: Examine side gear and differential pinion thrust washers for wear. If any wear is evident, replace. Make sure that case halves are assembled in their original position by noting marks made during disassembly.

2) Ring gear is installed by using suitable riveting jig (SE-1575) and specified riveting pressure. Ring gear and pinion must be installed as a set.

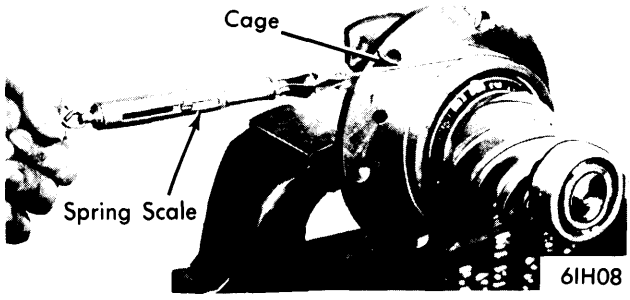
Pinion Depth & Bearing Preload – 1) Before pinion and ring gear can be adjusted for correct tooth contact, pinion bearing preload must be set. This is accomplished by selecting the correct size spacer, located between pinion thrust bearings, and tightening pinion shaft nut.

2) Temporarily bolt together pinion, cage, and pinion flange assembly, less oil seal and retainer. Clamp assembly in vise by the pinion flange, and tighten pinion shaft nut. Cage should be rotated while tightening shaft nut in order to properly seat bearings. Bearing rollers must be seated against face of bearing cone, and there must be no clearance at large end of bearing rollers (see illustration).



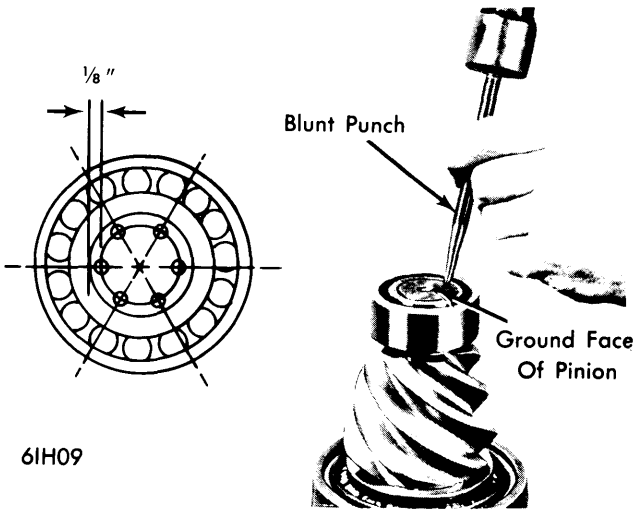
CORRECT BEARING ROLLER POSITION

3) To measure preload, wrap a cord or soft wire around pinion cage and attach free end to spring scale (see illustration). Pull on scale and note tension after cage begins to move; ignore initial starting tension. If tension is not to specifications, adjust by replacing spacer with thicker or thinner spacer as required. A spacer that is close to dimension can be worked on emery cloth to necessary size. Be sure to wipe all filings from spacer before installing on shaft.



MEASURING PINION BEARING PRELOAD

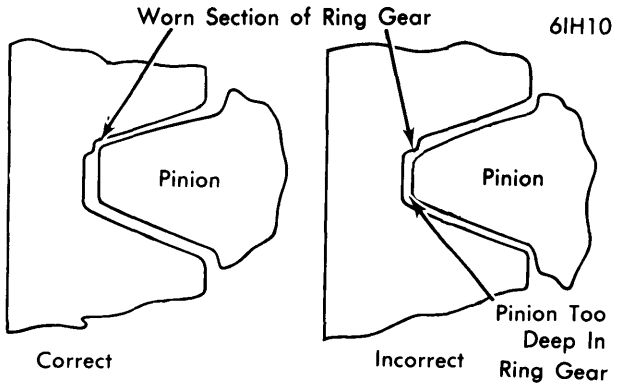
4) If pilot bearing was removed from pinion shaft, it is replaced by pressing it onto end of shaft and staking it into position. Staking should be done with a blunt punch at six equidistant points 1/8" in from shaft outside diameter (see illustration).



STAKING PINION PILOT BEARING

5) Install pinion, cage, and bearing assembly in differential carrier. Add or subtract, as indicated, correction figure etched on end of pinion gear to specified pinion gear depth. Using a suitable gauge or fixture, establish pinion gear depth, measuring from machined surface of pinion to center of ring gear. Increase or decrease shim thickness, as required, to obtain corrected pinion depth.

Backlash & Side Bearing Preload – 1) Install differential case assembly in carrier. Using a dial gauge, measure ring gear backlash. If backlash figure is not etched on ring gear, see specifications for proper tolerance. To adjust backlash, turn side bearing adjusting nuts to move ring gear either in or out.



PROPER WORN GEAR INSTALLATION

IHC FULL FLOATING AXLES (Cont.)

2) When original gear and pinion sets are being reinstalled, wear pattern of gear teeth must be considered. Gears that have been in service for long periods form running contacts which should not be greatly changed. If, in checking backlash, amount measured is in excess of amount specified, backlash may be reduced only by amount that will avoid overlap of worn tooth section. Any overlap of worn section will cause gear operation to be rough and noisy.

3) Mount dial indicator at side of ring gear. Loosen bearing caps only enough to allow slight bearing movement. Loosen adjusting nuts until slight bearing end play is indicated on dial indicator. Tighten adjusting nuts to reduce end play to zero, but no tighter. Rotate ring gear to check for runout. If runout exceeds .008", remove case and check for cause. Tighten bearing adjusting nuts specified number of notches to preload bearings, then tighten bearing cap bolts. Recheck backlash to insure that it has not changed during preload adjustment. Install adjusting nut locks.

4) Check gear tooth contact using paint impression method described in this section.

Final Assembly – *See Differential Carrier.*

AXLE ASSEMBLY SPECIFICATIONS

Ring Gear Backlash	.004-.006"
Side Bearing Preload	1 Notch
Pinion Bearing Preload	3-8 Lbs.
Pinion Gear Depth	2.9830"

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Pinion Shaft Nut	200-230
Pinion Cage To Carrier	30-40
Carrier-To-Housing	80-90
Differential Case	40-50
Bearing Cap-To-Carrier	80-90
Axle Flange-To-Rear Hub	80-90

RIVET PRESSURE

Application	Pressure (Tons)
Ring Gear	18-20