

The Model A Ford Front End

The front end of the Model A Ford and the condition of its components is critical to safe operation and driving pleasure. The front end provides the vehicle's steering, supports half the vehicle's weight, and provides a significant portion of the stopping ability. The front end consists of the axle, spindles, spindle bolts (kingpins), steering gear, radius rod, spring perches, steering arms, tie rod, drag link, front spring, spring shackles and bushings.

The front axle is the same for all model years with only minor changes to the spindle bolt locking pin, castellated nuts, and stampings on the axle.

INSPECTION

Visually inspect the front end components. With the vehicle on a flat level surface does it sit square? Do the wheels appear to have the same lean in and out? Does one wheel appear to be higher than the other? Is the tie rod worn from rubbing on the drag link? Are the cups on the drag link and tie rod worn? Are the grease shields on the drag link and tie rods in place? The purpose of the visual inspection is to identify obviously wear or problems to address.

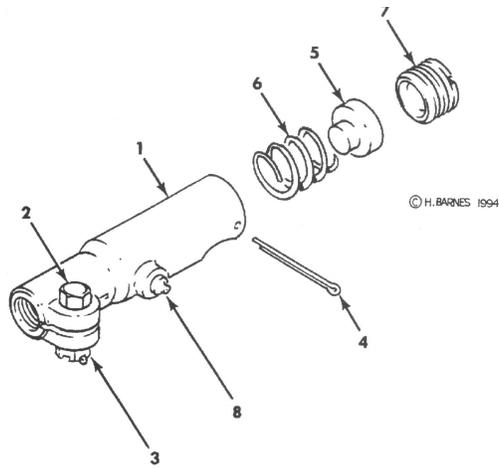
Jack up the front end and place jack stands under the axle. Grasp the wheels at the top and bottom and try to move them looking for play in the spindle bolt [kingpin]. If there is more than 1/64th of an inch the spindle bolts need to be refurbished or replaced. To make sure the play is in the spindle bolts place a chisel between the spindle and axle to immobilize the spindle. If the play is still present it is in the wheel bearings and may be solved by tightening the axle nut. If the play is gone the spindle bolts or bushings are worn requiring replacement.

DISASSEMBLY

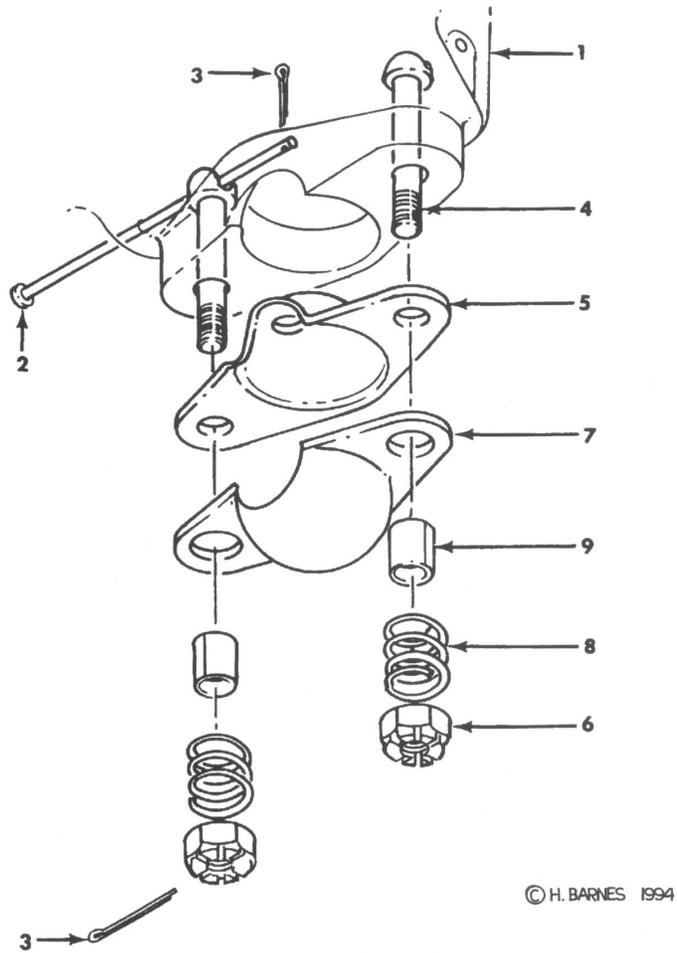
There are several different methods to remove the front end. This is my preferred method.

Jack the vehicle's front end up and place good jack stands under the frame.

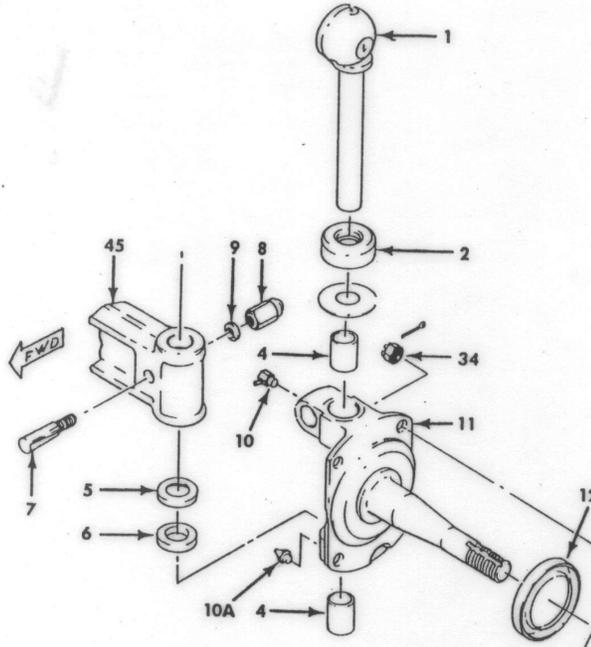
- Disconnect the drag link from the pitman arm by removing the cotter key and then backing off the adjusting end cap. The link can be rotated down and away slightly to separate it from the arm.



- Disconnect the radius rod ball and cap from the flywheel housing by removing the two cotter keys and then the nuts and lower cap. Note the positioning of the springs and spacers. See illustration:



- Disconnect the front brake actuating rods from the brake actuating levers by removing the cotter pin and then the brake rod pin. *Inspect* the brake rod pin for wear and the brake rod ends and actuating lever ends for wear. It may be necessary to repair or replace them for a tight fit when you reassemble.
- Disconnect the shock absorber links from the shock absorber arms. The link may be left on the spring perch. Original links are removed by removing the cotter pin and backing out the end cap then rotating them slightly to free the ball on the shock arm. *Inspect* the shock arm ball. These should be round and free of excessive wear. If they are worn they must be rebuilt or replaced.
- Place a jack under the axle. Unbolt the two U-bolts on the front cross member that hold the front spring in place and remove the front spring clip bar. Lower the jack and the front end should now drop down and can be rolled out from under the car. Occasionally you may need to tap on the head of the spring bolt where it comes through the cross member to free the spring.
- Support the axle with jack stands. Remove the wheels.
- Remove the drag link from the steering arm on the left (drivers) side.
- Remove the tie rod from the left and right steering arms. Removal requires removing the cotter pin on each end then backing out the end cap. Rotating the tie rod will free it from the arms.
- Remove the cotter key and the hub nuts then remove the front hub. The washer and outer wheel bearing usually stay in place when the hub is removed. *Note:* It may be necessary to back off the brake adjusting wedge if the hub is tight.
- Remove the brake springs, brake shoes, and inner wheel bearing. The front grease seal is metal and may come off the spindle or it may remain.
- Remove the cotter pin, brake wedge stud nut, brake wedge stud with wedge and allow the brake operating pin and felt to drop out.
- Remove the cotter pins and the four backing plate mounting bolts. Remove the backing plate and front grease baffle.
- Remove the locking bolt from the axle. This bolt holds the spindle bolt in place and keeps it at the correct angle. Depending on year it may or may not have a castellated nut.



- Loosen the nut holding the brake actuating assembly in place. The assembly will come loose with the spindle bolt.
- Remove the spindle bolts by twisting the head outward – to the left on the left side and to the right on the right side. As you rotate the spindle bolt the front brake actuating assembly come free from the head of the spindle bolt and can then be removed. The spindle bolt will come out with the king pin bearing, the felt washer and cup, and probably a king pin shim. It may require some pressure using a brass drift to remove the spindle bolt. See illustration for components:
- Remove the spindle then remove the steering arm.
- Use a front spring spreader to spread the front spring taking up the tension. When the spring shackles are free remove the cotter pins, shackle bar and shackles. The front spring will come free.
- The last part of disassembly is to remove the spring perches and separate the axle from the radius rods (wishbone). Remove the two special nuts on the bottom the perches and then remove them from the axle. Depending on the age and condition this maybe extremely difficult requiring an impact wrench, penetrating oil, heat, and considerable pressure. A hydraulic press (20 tons or more) works best if the perches are really stuck.
- Thoroughly clean and inspect all parts.

THEORY

The Model A axle controls two important aspects of steering – caster and camber.

Caster is the forward (negative) or backward (positive) tilt of the steering spindle axis. Caster allows vehicles to self-center or track. On the Model A caster is positive by five degrees. Think about a bicycle, the front forks have a rearward tilt towards the

handlebars giving the wheel a positive caster. This causes the bicycle to track or self-center and is why you can ride one with no hands (not a safe practice, but we all did it as kids). Caster provides a distinct center point for the steering, a point where it is clear the vehicle is going in a straight line. It is also why the Model A will continue down the road if you remove your hands from the wheel. The Model A caster is determined by the axle and the radius rods. The axle and radius rods must be straight and the ball on the end of the radius rods must be in good condition and properly attached to the flywheel housing.

Camber is the tilt of the top of a wheel inwards or outwards (negative or positive). Proper camber makes sure that the tire tread surface is as flat as possible on the road. If your camber is out, you'll get tire wear. Too much negative camber (wheels tilt inwards) causes wear on the inside edge of the tire. Consequently, too much positive camber causes wear on the outside edge.

Negative camber is what counteracts the tendency of the inside wheel during a turn to lean out from the center of the vehicle. Zero or Negative camber is necessary in the Model A. Positive camber would create handling problems. Ford built camber into the front axle by fixing the angle of the spindle bolt. When the axle is straight there are 2 ½ degrees of negative camber. When you look at a good running Model A from the front you will notice top of the wheels are tilted in slightly.

INSPECTION & RESTORATION OF PARTS

Axle – lay the axle down and take a straight edge along the front and back of the axle check that it is straight. If there are waves or a bow in the axle it must be sent to a shop equipped to straighten axles or be replaced. Axle shops use very large hydraulic presses to cold form the axle back into shape. Check the ends of the axle where the spindles ride, they should be straight across each load-bearing surface. Check the holes for the locking bolt; they should be straight and uniform.

Radius Rod (Wishbone) – lay the straight edge along the top of each side of the wishbone. The rods should be straight. Lay the straight edge along the outside of the radius rods and they should also be straight. The cupped ends where the spring perches attach should be even and round. If the radius rods are bent the assembly should be replaced, repairs to the radius rods are very difficult and usually unsuccessful. Inspect the ball on the end of the wishbone. It should be a ball 1" in diameter. If excessively worn it can be built up and ground back to size and shape by a skilled welder or if necessary replaced. The parts suppliers sell a weld-in steel ball for the wishbone. Some restorers use the neoprene type replacement offered by the various parts suppliers to help with a worn ball. Inserting a large cup shaped washer is another alternative to obtain the correct alignment of the front axle.

Spindles – inspect the treads of the spindle for excessive wear, they may be chased with a 9/16 x 18 die. If the treads are excessively worn you should find a new spindle. Check the bearing surfaces for both the inner and outer bearings. Lack of lubrication often creates wear in these areas. If excessively worn you need to find a new spindle. With the check the spindle bushings – these should be replaced along with the other spindle bolt components.

Spindle Bolts (Kingpins) – inspect the spindle bolt. The shaft should show no signs of wear. If there are signs of wear replace the spindle bolt. Spindle bolts are often good as they are hard steel and it is the bushings that wear out. Spindle bolt bushings are

made from softer material. The Model A parts supplier can furnish kits with all the components including spindle bolts or without.

Wheel Bearings – inspect the wheel bearings for any signs of heat, pitting, or wear. Any questionable bearings should be replaced.

Locking Pin – inspect the locking pin. You will note the angled wedge portion that engages the notch on the spindle bolt. There should be no deformation of the metal. If there is a ridge you can either replace the locking pin or dress up the surface of the wedge with a fine file.

Pitman Arm - inspect the pitman arm ball, if it is worn it must be replaced. Good steering requires all of the balls on the drag link and tie rod ends to be perfectly round. Excessive wear on the pitman arm ball results in hard steering and instability on the road. The ball may be replaced by cutting off the old one, drilling a hole through the arm, pressing in a replacement ball from one of the parts suppliers, and welding it in place. The larger parts suppliers offer this service if you send in your arm.

Steering Arms - inspect the balls on the steering arms. Like the pitman arm ball they must be perfectly round. If they are not they must be rebuilt or replaced using the same process as described for the pitman arm.

Drag Link and Tie Rod – inspect the springs, internal cup, and cap. If there is any sign of wear on the cup or cap they should be replaced. The after market kits come with new springs that are often not as good as the original springs. Inspect the springs and if the old ones are good with no sign of wear and the correct length, recommend reusing them. Many restorers replace the original cups with Teflon “easy steer” kits. This seems to be a good solution, but is more expensive.

Shock link – inspect the shock link springs, cups, and caps like those of the drag link, if worn replace them. The shock arm and the spring perch balls should also be inspected and can be replaced like those on the steering arms if necessary using the appropriate smaller ball available from various suppliers.

Brake Components – while the front end is disassembled inspect the backing plate and the roller track, rebuild or replace the roller track as necessary. Inspect brake shoes, springs, and front drums – replace as needed. Inspect the brake wedge, operating pin, and actuating arm if the cups on the actuating arm or wedge are excessively worn replace or repair. If the operating pin is worn or bent replace it. The brake actuating rod should rotate smoothly with minimum play, if it is loose or rotates with difficulty it should be rebuilt or replaced.

Spring Shackles – now is a good time to inspect the spring shackles and particularly the bushings. The shackles should fit smoothly in the bushings with a little bit of play – this is the space filled with grease to allow the axle to move with the spring. The bushings should be round and of an even thickness. If the bushings are worn they should be replaced. There is a bushing on each end of the spring and in each spring perch.

Spring Perches – inspect the spring perches, if the area where the shackle bushing goes in is badly worn they should be replaced. The shock absorber link ball should be round and in good repair, the shaft should be straight and the eyelet where the brake actuator arm attaches should be round.

Spring – inspect the spring and the ends of the leaves. If they are gouging the leaf under them or extremely rusty the spring should be rebuilt by grinding off the

gouging and beveling the ends of the leaves so they do not gouge. This is potentially dangerous and adequate safety measures are necessary. Refer to Les Andrew's *Mechanics Handbook* for detailed instruction.

ASSEMBLY

Once all components have been cleaned, inspected and refurbished or replaced the assembly is basically a reverse of the disassembly. The following is the sequence for assembly.

- ⊗ Put wishbone on the axle using the spring perches and the special spring perch nuts – ensure the shock absorber ball faces to the outside towards the wheel and the axis of the perch is parallel to the axle. Torque to 100 ft lbs if dry or 65 ft lbs if covered with anti-seize. [Anti-seize is recommended as it makes future disassembly much easier. Anti-seize compounds reduce torque by 45%.]
- ⊗ Install front spring using spring shackles. The spring should be spread with the spreader and new bushings pressed in the spring and reamed to the correct size. The same for the bushing in the spring perches. The grease fittings on the shackles face to the front put the shackle bar on and the two nuts. Tighten the nut fully until it will not move using a standard wrench (no cheater bars or big tools). Back the nuts of ½ turn and then install the cotter pins. This ½ turn is necessary to allow the grease to flow correctly and to allow the spring and axle to move. If tightened too far movement is restricted and the bushings, perch and spring will wear excessively. This is very important for a smooth driving car.
- ⊗ Install the spindles using the spindle bolts, ball bearing, shim, felt washer and cup. See the diagram for assembly. The felt washer should be soaked in oil prior to installation and the pieces hand fitted. The shim under bearing is necessary as the new bearings are slightly undersize from the original, without the shim the alignment of the spindle bolt will be incorrect. The spindle bolts have a right and a left. The protrusion of the spindle bolt goes to the front and the cup goes towards the inside so the notch lines up in the hole where the locking pin secures it.
- ⊗ Install the brake actuating assembly. You will need to rotate the head of the spindle bolt to complete the alignment. Tighten the attaching nut firmly.
- ⊗ Install the locking pin and nut. Tap the locking pin in with a small hammer ensuring the wedge lines up with the notch in the spindle bolt. Tighten the special nut firmly. The special nut acts as the wheel stop and limits the turning of the front wheels halting the rotation before the wheel contacts the drag link and frame.
- ⊗ Install the backing plate and grease baffle using the four bolts and nuts. The head of the bolt goes inside the wheel. Install cotter pins or lock washers as appropriate for your model year.

- ⊗ Install the brake-operating pin with felt washer. The small felt washer fits up into the spindle bolt. The head of the operating pin fits up into the spindle bolt and connects with the brake actuating assembly arm. Install the brake wedge in the backing plate and the bottom of the operating rod goes in the top of the wedge. If you chose to use brake floaters for the front now is the time to install them rather than the standard wedge.

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ALIGNMENT / ADJUSTMENT