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**\*\*\*\*\* BRAKES \*\*\*\*\***

**Revised April 27, 2009**

LOCKHEED '39 THROUGH '48 FORDS AND MERCS: These brakes were designed and manufactured by Lockheed. Hydraulic pressure expands the wheel cylinder cups, which push the shoes against the drum. The shoes are NOT self-energizing. The Lockheed system is a front/rear shoe design with the bottom pivot for each shoe anchored to the backing plate. This design requires more pedal pressure to stop than self-energizing brakes since they rely solely on hydraulic pressure. The front shoes (primary) do most of the stopping and normally use a longer friction band. The rear shoes (secondary) normally use a shorter friction band.

'39-'48 LINCOLNS AND '49-'53 FORD/MERC: These are designed and manufactured by the Bendix Corp. They are self energizing (often referred to as duo servo) brakes. The self energizing is caused by the two shoes being linked to each other at the bottom, but are NOT attached to the backing plate (like the Lockheed design is). The top of the primary shoe is moved outward by hydraulic pressure from the wheel cylinder to contact the drum. The rotation of the drum "wedges" the floating primary shoe to move it downward. Since the bottom of the two shoes are not anchored to the backing plate, this rotation movement is transmitted through the rear most shoe where it forces the shoe against the drum. This increases braking substantially and decreases brake pedal effort. This results in considerably more braking force than the sheer hydraulic pressure design used in the earlier Lockheed brakes.

The primary of a Bendix system is still the front shoe in all wheels... just like the Lockheed brakes are. However since the Bendix is self-energizing, the rear (secondary) shoe applies much more stopping than the front (primary) shoe does. The secondary shoe now has the longer friction band and the primary now has the shorter friction band. Now the question is: Are you confused yet?

The Bendix brakes adjustment is easier than the Lockheed brakes.

F-100 BRAKES FOR EARLY FORDS: These are Bendix brakes. Conversions require drums, backing plates, and hubs from a '53-'56 Ford F-100. These drums use the same large bolt wheel pattern as the '40 through '48 Fords do. One pair of Timken #14116 inner bearings, one pair of CR Services #15214 oil seals, and both '37-'48 Ford spindles are needed. The '39 through '41 spindles have a round flange and require modifying because the wheel cylinder will not clear the spindle flange. Grind off the top of the flange that interferes with the wheel cylinder. The '42-'48 spindles have a somewhat squarer flange which clears the wheel cylinder and grinding is not required. On both round and square flanges, the new inner bearing has a square shoulder which conflicts with the rounded race on the spindle. Grind the inside of the bearing race to round it slightly so the bearing will fit snugly against the spindle's mounting face. Every thing else bolts together.

EARLY WIRE WHEELS ON '40 THROUGH '48 DRUMS: When using early spoke wheels, spacers are needed between the drum and the wheel because the early drums have a taper where the wheel meets the drum. The '40-'48 disc wheels did not have this taper. If the drums are bolted up without the adapter, the drum will NOT be seated tight against the drum and all force is transmitted directly to the wheel lugs...not a good thing.

SQUEAKING BRAKES: Squeaking is often caused by either/or oil or brake fluid on the brake linings. But squeaking can also be inadequate lubrication at some friction points. Apply a small film of grease, or a single drop of oil, where ever ANY metal part of the shoe contacts anything metallic. This includes; the shoe to backing plate rub points, where the emergency brake cable connects to the actuating arm, the emergency brake actuating arm pivot pin and wave washer, where the emergency brake cable exits the cable's housing, the brake shoe holding pins and washers, and wherever the springs etc. come into contact with the shoe or backing plate.

An old trick we used to use was to stretch a screen door spring around the brake drum to dampen drum vibrations. This worked to stop squeaking brakes..... sometimes.

If your brakes have been in use for some time and they begin squeaking, try going over the linings with 80 grit sand paper to remove any glaze. Just scuff them enough to break the glaze. And clean them with lacquer thinner and lube all friction points.

#### \*\*\*\*\* ADJUSTING BRAKES \*\*\*\*\*

ADJUSTING ANCHORS ON '39-'41 FORD/MERC BRAKES: These are Ford Lockheed (not Bendix) brakes and use special brass washers in conjunction with eccentric anchor bolts to position the shoe. The top of the shoes are controlled by eccentric cams. The anchor bolts at the bottom of the backing plate control the shoe position by rotating eccentric washers at the bottom of the shoes. Before starting to adjust, verify all anchor bolts turn freely.

The '39-'4 use anchor bolts which have locating marks (either a dot or an arrow for position reference) indented on the elongated 1/4" head of the bottom adjusting bolt. These anchor bolts extend through the backing plates from the drum side and are adjusted externally after loosening their large external lock nuts. After adjusting the shoes, the adjustor lock nuts are tightened without permitting rotation of the anchor pin adjusters.

(1) Always rotate the wheel in the same direction the wheel turns as when the car moves forward.

(2) Begin by backing all the way off, the two 11/16" eccentric adjusters at the top of the backing plate until the wheel turns freely. Then slightly loosening both bottom anchor bolt lock nuts (3/4") on the back of on backing plate. Turn all of the two elongated locator marks (either an arrow or a dot) on the 1/4" adjusters so they face each other.

(3) Further adjustments are made by turning the anchor bolt adjusters in a SPECIFIC direction.....

(a) Driver's side. The front shoe anchor  $\frac{1}{4}$ " adjuster bolts (with the dot or arrow) on the both the front and rear wheels are rotated counter-clockwise when looking at the back of the backing plate. The rear shoe anchor  $\frac{1}{4}$ " adjuster bolts (with the dot or arrow) on both the front and rear wheels are rotated clockwise. This is VERY important.

(b) Passenger side. The front shoe anchor  $\frac{1}{4}$ " adjuster bolts (with the dot or arrow) on both the front and rear wheels are rotated clockwise when looking at the back of the backing plate. The rear shoe anchor  $\frac{1}{4}$ " adjuster bolts (with the dot or arrow) on both the front and rear wheels are rotated counter-clockwise. This is VERY important.

(4) Now turn one of the upper adjusting  $\frac{11}{16}$ " eccentric cams until the wheel cannot be turned. Adjust its  $\frac{1}{4}$ " anchor bolt in the correct direction until the wheel just does turn. This lowers the shoe and moves the toe of the shoe away from the drum, which will result in fuller shoe contact.

(5) Repeat step (4) over and over on the same shoe until turning the anchor bolt will not free-up the wheel.

(6) Back off the upper anchor pin very slightly until the wheel will just barely turn. Tighten the anchor pin lock nut ( $\frac{3}{4}$ " ) and then adjust to the other shoe on that wheel.

(7) Thereafter, it's common to never needing to adjust anything other than the top eccentric cam.

TIP: If you're installing new shoes, which have been arc-ground to fit the drum, you normally will not have to go through the preceding exercise. Turn the dots/arrows until they're facing towards each other and tighten the  $\frac{3}{4}$ " anchor pin nuts. This correctly positions the brake shoes and you don't have to go through the anchor pin adjusting..... just adjust the upper  $\frac{11}{16}$ " cam adjusters.

ADJUSTING '42-'48 BRAKES: The anchor pins are different than the '39-'41 Lockheed brakes, but do not have any reference marks on the backside of the anchor bolts. And they adjust differently. Instead they have one flat side ground on their large round shallow bolt heads. The flat sides are turned so they face each other. This is usually all the adjustment needed due to the semi-floating design of the anchors. Tighten the large nuts (which are on the inside of the brake drum) and put on the brake drum. Adjust the upper eccentric cams and you're through.

### \*\*\*\*\* WHEEL & MASTER CYLINDERS \*\*\*\*\*

WHEEL CYLINDERS ON FORD LOCKHEED BRAKES: As discussed before, these brake systems rely solely on hydraulic pressure to push the shoe against the drum. The shoes that have the longer frictional bands naturally require more pressure than a shoe with a shorter amount of frictional material. Most Lockheed wheel cylinders have two different sizes of cups. The larger size cup is for the forward-most shoe (has the longest friction band).

HONING: Honing wheel and/or master cylinders during rebuilding is critical. Use of cutting oil in place of kerosene/solvent/gasoline when honing hydraulic cylinders will produce a superior surface in considerably less time. The hone

scores made using cutting oil provide a much better sealing surface than when using solvent/kerosene/gasoline. Be sure to thoroughly clean the cylinder after honing.

**BLEEDING A REPLACEMENT MASTER CYLINDER.** This is used only when replacing a master cylinder. Because all of the air is usually located at the master cylinder's fitting connections, it will often bleed back into the master cylinder with a just a tad bit of coaxing.

Top off the master cylinder and install the master cylinder's cap. Pump the brake pedal about 10 pumps quickly (it'll be low). Then remove your foot from the brake pedal to permit the air to dissipate for a minute or so. Repeat again for 10 pumps and wait again. Top off the brake fluid. Repeat it once more. After the third time, the air should have bled off and you should have a firm pedal. If you don't have a firm pedal, try it a couple more times. If you still don't have a firm pedal, there is air elsewhere in the system and you'll have to bleed the entire system.

This sure beats jacking up the car and bleeding each wheel. Naturally, if you're going to flush the system you'll get to bleed all four wheels.

**SILICONE BRAKE FLUID:** Pretty neat stuff and it doesn't eat paint. But I use it only in a show car. Reasoning? I often have trouble getting a firm pedal when using this stuff. I've been told I've introduced tiny air bubbles when I put the silicone in the master cylinder. Which produces a spongy pedal. I've tried several different methods when filling the master cylinder to prevent introducing air, but still have a spongy pedal. However, many use silicone with absolutely no problems. As with all this garbage I've written this is just my opinion.

(From rodnut on 1/30/03: Another problem is it will damage the diaphragm in hydraulic brake light switches....Use a mechanical type brake light switch.)

**BLEEDING A DRUM/DISC BRAKE SYSTEM:** If you're running a combination brake system (example: disc front and drum rear) you're probably using a proportional valve to control the hydraulic pressure to the rear brakes. Bleeding this type of system is different than bleeding an all-drum or all-disc system. The proportional valve for the drums shuts down when it senses any pressure in excess of the proportional valve's pressure setting. Consequently we can't just have a buddy stomp on the brake pedal and bleed the system. Pressure brake bleeders are mostly limited to 15 psi to keep from activating a proportional valve or metering valve. If you don't have a pressure bleeder, have your buddy push the brake pedal gently (like with only his big toe) so the pedal applies very little pressure while you bleed the system. Good luck with this.

**SOFT BRAKE PEDAL ON A DISC/DRUM BRAKE SYSTEM:** Sometimes after you've worked on a disc/drum brake system the pedal is soft and feels like "it's going away" when stopping. Scary isn't it? After much trial and error, I found the cause is simply the rear drum brakes are out of adjustment. Especially if you're just converting to front disc brakes. Adjust these puppies fairly snug and see if it doesn't help the pedal.

Also, the disc brake rubber flex hoses expand considerably due to high hydraulic pressure unless they're new or in top shape. Some come with multi-bands of steel wrapped around them to strengthen them. Have a buddy stomp on your brake pedal hard while you've got your hand wrapped around one of the rubber flex hoses.

It probably expands a lot more than you imagined. One cure I use (instead of replacing it with another new rubber hose) is to use a steel braided flex hose. These are usually cheaper than a stock Ford rubber flex hose and help firm the brake pedal. Most speed shops have the equipment to make one to your spec's.

\*\*\*\*\* **BRAKE DRUMS** \*\*\*\*\*

PULLING A REAR BRAKE DRUM WHEN A PULLER IS NOT AVAILABLE. These can try the patience of any man. The following is certainly not intended to replace a correct puller, but it's saved me several times when the correct tools weren't around.

I use a bumper jack and the weight of the car to help break the drum loose. Let's say you want to pull the right brake drum. Get the car on a reasonably level surface and block both ends of both front wheels to prevent forward or backward motion. Release the emergency brake and take it out of gear. Leave the right side wheel bolted to the drum and remove the right axle nut and washer. Invert the axle nut and put it back on the axle sans washer (don't want to pound on the castellated part) until it's flush with the axle end. Jack up the left (yeah.....the left side) rear side of the car with a bumper jack. Get it high enough so the left rear wheel is off the ground a mite bit. Grab a hand sledge hammer (to persuade the drum to loosen). Go back to the right rear wheel. Plant your butt against the fender or body and lean against the car. Lean hard enough so it feels like it's about to rock off the bumper jack. Then hit the axle nut a few times while you're leaning hard against the car. The tipping weight of the car pulls more or less evenly against the right wheel which is still on the ground. The drum will usually come loose after only a few healthy swings. And if the flathead gods are smiling down on you, you didn't damage the axle threads so bad that a couple of swipes with a file won't cure.

However, there are those that won't come loose no matter what. Remove the axle nut and washer. Reinstall a cotter pin only. Now drive around in circles with that wheel on the inside of the circle. After a few hard circles, you should hear the wheel thunk pretty good. It's worked for me several times.

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