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No. 9775

HOW to do the COMPLETE DISC AND DRUM brake job

a step-by-step illustrated manual to make the job easy

AMMCO Tools, Inc.
2100 Commonwealth Avenue
North Chicago, Illinois 60064

TOOLS required for Brake Jobs

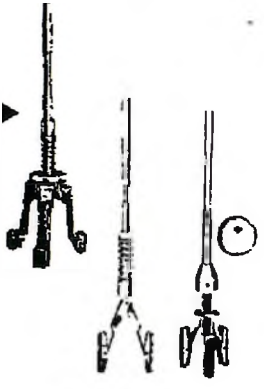
These special tools are among the most important tools required for brake service work. They are designed to save time and help do the job right.

◀ NO. 2650
BRAKE HAND TOOL KIT
Contains tools for removing, replacing, adjusting brake shoes; bleeding brake systems, etc.

MODEL 7150 BEARING PACKER ▶
Fast—easy to use. Eliminates messy cleaning and inadequate hand packing. No chance of air pockets.

◀ MODEL 7400 BRAKE BLEEDER
For fast, safe brake system bleeding. Design prevents possibility of air entering system.

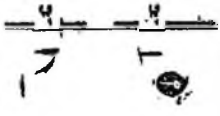
MODEL 9575
DISC BRAKE CALIPER HONE ▶
Handles all domestic and foreign cars. Driven with portable electric drill. Adjustable honing pressure.



MODEL 8650 BRAKE SHOE ADJUSTING GAGE
Quickly gives correct lining-to-drum clearance—before drums and wheels are installed. Transfers drum diameter directly to brake shoes. A *must* for self-adjusting brakes. No need to back car up to adjust brakes.

MODEL 3750 MODEL 1650

BRAKE CYLINDER SURFACING HONES for brake wheel and master cylinders. Flexible drive allows honing wheel cylinders on the car.



MODEL 8500
BRAKE DRUM MICROMETER
Checks out-of-roundness as well as diameter. Handles drums 6" to 16¾" . . . with extension bar to 26".

TORQUE WRENCHES
Assure correct torque and compliance with factory specs when tightening brake system components. Swivel Head and Fixed Head Models. Memory feature (pointers hold reading) on Fixed Head Models.

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HOW to do the COMPLETE DISC AND DRUM brake job

by Walter Alley

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AMMCO TOOLS, INC.
NORTH CHICAGO, ILLINOIS

Printed in USA

HOW TO PERFORM THE COMPLETE DRUM BRAKE JOB

Figure 1 — Checking the master cylinder for a defective primary cup.

Step No. 1 -- Test the Hydraulic System.

Check the operation of the master cylinder.

A. Primary Cup. A defective primary cup may be detected by slowly and firmly depressing the brake pedal. If the brake pedal becomes hard, then slowly fades to the floor, brake fluid is by-passing the primary cup or is leaking from some other part of the system. Usually, by inspecting the master cylinder reservoir for fluid level, you can get an indication of whether the primary cup has failed or some other hydraulic part is defective. Asking the car owner if he has had to replenish the fluid in the master cylinder recently often provides an answer. A defective primary cup will cause loss of pedal with no resulting loss of brake fluid. Rebuild or replace the master cylinder to correct a defective primary cup.

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B. Secondary Cup. Loss of brake fluid can be the fault of a worn secondary cup. When the inside of the boot at the rear of the master cylinder is wet with brake fluid, the secondary cup has failed. When the master cylinder is bolted to a vacuum cylinder power brake unit, check the secondary cup for leakage by removing the vacuum hose at the power unit. Evidence of fluid in the hose indicates a worn-out secondary cup. Replace or rebuild the master cylinder to correct a worn secondary cup.

Figure 2 — Checking the master cylinder for leakage at the secondary cup by squeezing the master cylinder boot.

Step No. 2 -- Check Stop Lights.

When the master cylinder is being checked for operation, the stop lights are observed for proper operation. Inoperative stop lights could be due to:

1. Blown fuse in circuit.
2. Defective bulbs in tail light sockets.
3. Defective stop light switch.

Figure 3 — Mark a wheel stud and its corresponding wheel stud hole with crayon to maintain the wheel balance after a brake job.

The stop light circuit is an important part of the complete brake job. Safety demands that the stop lights always be operating correctly. Repair the stop light before the brake job is started; otherwise, it will be forgotten when the car is delivered to the customer.

Step No. 3 -- Loosen Wheel Nuts.

Remove the hub caps and loosen the wheel nuts. Mark one stud and its corresponding hole in the wheel to maintain wheel balance. When the vehicle has a tapered rear hubbed drum, remove the cotter-key from the nut and loosen the axle nut.

Figure 4 — Place hub cap inside of wheel to prevent scratching the cap. Notice labeling of L. F. brake drum. Notice also that the lug nuts were replaced on the studs to allow for chatter free drum turning. All 1959 through present model Chevrolets have floating drums on the front hubs.

Step No. 4 -- Support Vehicle off Floor.

Support vehicle on jack stands under the body of the vehicle. Do not support the vehicle under the axle or lower control arm since the stands will get in the way. Many rear wheels are difficult to remove from the rear axle because of low fenders. By placing the stands under the frame of the vehicle, the wheels will hang down on their springs, resulting in easy removal of the rear wheels.

Step No. 5 -- Remove Tires and Wheels

Remove all wheel nuts and place them in the hub caps for storage. Place the tire next to the brake assembly. Lay the wheel down with the outside or white-side wall next to the floor. Place the hub cap upside down in the wheel to prevent it from being scratched up. Use the hub cap to store brake parts.

Step No. 6 -- Mark Identification on Drums.

Mark each drum according to location on the vehicle, L.F., R.F., etc. Many vehicles have left-hand studs and nuts on the left side of the vehicle and right-hand studs on the right side of the vehicle. Also, the front wheel bearing parts have run-in to each other, and mixing the bearings can cause premature failure.

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Step No. 7 -- Measure Drums with a Brake Drum Micrometer.

Remove the drums from the front spindles. Use the spindle nut to help pull the inner bearing and seal.

A. Check Drums. Measure all drums with a Brake Drum Micrometer. Determine whether the drums are worn beyond safe limits. Most drums are worn beyond safe limits if, after machining, the drums will be .060" greater than the original new car size.

B. Check for Hard Spots. Excessive hard spots, (blue marks showing in the middle of the drums wearing surface) may be cause for discarding the drum.

C. Check Drums for Out-of-Round. Measure the drum diameter in more than one location. Variations in the readings indicate an out-of-round drum.

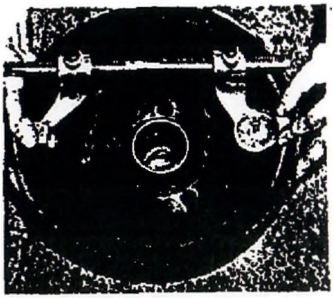

Figure 5 — Check drums with a Drum Micrometer.

Step No. 8 -- Mount Largest Rear Drum on Brake Drum Lathe.

Check for Drum Wobble.

Check mounting of drum on Lathe by making a light scratch on the drum's wearing surface while the drum is revolving. Loosen the Lathe's arbor nut and revolve the drum one-half turn. Make another trial cut with the tool bit. If the two scratch cuts are side by side, the drum is wobbling. A drum that has excessive wobble or lateral runout will cause the brake pedal to pulsate or move up and down as the brakes are applied.

Figure 6 — Mounting of rear floating drum on the Drum Lathe.

Step No. 9 -- Clean Front Wheel Bearings.

While the rear drum is being machined or turned on the Lathe, the front wheel bearings are cleaned and inspected.

Figure 7 — Use air nozzle to help blow hidden grease from the wheel bearing. Caution - never spin the bearing as the rollers may fly out of the cage.

A. Clean inside of Hub. Wash all of the excess grease from the wheel hub. Modern wheel bearing greases need only be packed into the wheel bearing separator cavities.

B. Check the Bearing Races.

1. Pits or evidence of excessive bearing wear will be noticed on the surface of the bearing cup or races. Whenever the cup indicates bearing failure, replace the entire bearing assembly.

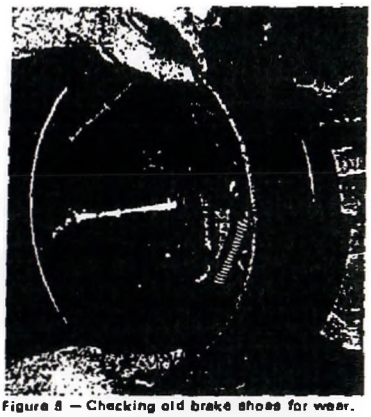

Figure 8 — Checking old brake shoes for wear. Wear pattern on brake shoes may indicate a problem.

2. A wheel bearing cup (race) is pressed into the hub at the time of vehicle manufacture. When a cup is replaced, care must be taken so that the old cup is properly removed from the hub. If the old cup is driven out of the hub in a cocked manner, the hub bore may be enlarged. The new bearing cup may now move or spin inside the hub. Correct wheel bearing adjustment cannot be achieved nor can the front drum be accurately machined on the Drum Lathe if the bearing cup is loose in the hub. Replace the hub and bearing cups if this condition is found.

Step No. 10 -- Mount the Other Rear Drum

Use the same Lathe setting as was required to machine the first drum.

Step No. 11 -- Inspect Old Shoes.

While the other rear drum is being machined, look at each brake assembly.

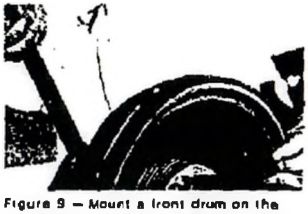

Figure 9 — Mount a front drum on the Lathe arbor. Notice a drum bearing protector between the Lathe and the drum. This Protector helps to prevent chips from entering the hub.

Check lining wear. Inspect the wear pattern of the brake lining on all four brake assemblies. Normal brake lining wear will leave little or no brake lining in the center of the shoe. The ends of the lining shoe show nearly equal thickness. This condition exists because the shoe platform does not bend to conform to the arc or the drum. The web of the shoe will not allow the shoe to flatten out. Whenever the shoe has more lining worn off one end of the segment than the other, these conditions might be present:

1. Misplaced anchor pin. The anchor pin was not correctly adjusted at the time of the last brake re-line. Check for an adjustable anchor pin.

2. Worn or distorted brake shoe. The anchor end of the shoe with repeated pounding of the shoe against the anchor may be deformed. The eye of the shoe is sometimes swaged flat which lets the shoe ride high on the anchor pin and in so doing, wears more brake lining off the heel or anchor end of the shoe than at the toe end of the shoe.

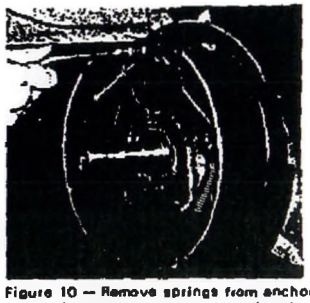

Figure 10 — Remove springs from anchor pin. The tool prevents excessive distortion of the spring during removal.

Step No. 12 -- Turn a Front Drum.

Mount the worst front drum on the arbor of the Lathe. Use a bearing protector over the hub of the drum to prevent the chips from getting into the inner race.

Figure 11 — Wire brush backing plate to remove dirt and rust. Grease on the backing plate should be removed with a solvent.

Step No. 13 -- Remove all the Shoes.

Remove all the shoes from the backing plate. Test each spring before it is placed in the hub cap. Either use a spring tester or drop the spring on a cement floor to determine if the spring is still usable. A weak or excessively heated spring will bounce and/or vibrate when it contacts the floor. A good spring will hit the floor with a dull thud. Observe the color of the springs. Color usually indicates a difference in spring tension. For example, a Chevrolet uses a gray spring on the primary shoe and a black heavier spring on the secondary shoe. The stronger spring keeps the secondary shoe against the anchor pin at all times, reducing brake noise.

Figure 12 — Loosen bleeder valve with a socket type wrench. An open end wrench will often round off a bleeder valve.

Figure 13 — Wheel Cylinder is removed from backing plate for disassembly because the wheel cylinder piston stops pressed into the backing plate will not allow the pistons to come out of the cylinder.

Figure 14 — Honing a wheel Cylinder with an inspection hone. Alcohol or brake fluid may be used as a honing fluid.

Figure 15 — Lightly coat the wheel cylinder cups and pistons with assembly fluid. Brake fluid may also be used.

Figure 16 — Removing the wheel cylinder from the brake hose.

Step No. 14 -- Turn the Other Front Brake Drum.

Use the same machine setting as was used to turn the first drum. If either drum contains hard spots, both drums must be ground.

Step No. 15 -- Clean Backing Plates.

Wire brush rust and dirt from the backing plates. If the ledges on which the shoes rest show evidence of deep scoring, the ledges should be ground down flush. Otherwise, the shoes will hang up as they slide over the grooved ledges.

Step No. 16 -- Inspect the Wheel Cylinders.

A. Loosen the Bleeder Valves. Using a suitable bleeder valve wrench loosen the bleeder valve in each cylinder. Excessive corrosion may require complete replacement of the cylinder because the bleeder valve may twist off.

B. Wheel Cylinder Piston Stops. Many wheel cylinders cannot be disassembled while still bolted to the backing plate. Wheel cylinder piston stops (a metal stamping that protrudes from the backing plate) are to keep the cylinder pistons from coming out too far when the shoes are removed. These stops require that the wheel cylinders be unbolted from the backing plate and be pulled out away from the stops in order that the cylinders may be disassembled.

C. Disassemble the Wheel Cylinders. Observe the condition of the pistons when they are removed from the cylinders. Minor corrosion can be scraped off of the piston head. If the brake fluid appears to be very dirty and dark in color, the brake system should be flushed before the cylinders are rebuilt or new ones installed. Flushing fluid is usually an alcohol base compound which dissolves the residue in the lines and hoses. The fluid is usually placed in a Bleeder which is

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Figure 17 — Disconnect the parking brake cable.

connected to the master cylinder. The flushing operation takes place until clear flushing fluid is coming from all four wheel cylinder locations. Brake fluid is then pumped through the lines with another Bleeder until fresh brake fluid is coming from the cylinders or lines.

D. Hone the Cylinders. A Brake Cylinder Hone is used to clean the wheel cylinder. Either alcohol or brake fluid may be used as a honing fluid. After the revolving Hone has been moved back and forth through the cylinder a few times, the cylinder should be flushed with alcohol and a clean shop towel pulled through the cylinder. If no defects appear in the cylinder wall, the cylinder may be rebuilt. If any defect appears, the cylinder should be replaced.

Step No. 17 -- Rebuild the Wheel Cylinder

After the cylinders have been honed with an Inspection Hone and found to be free of defects, the cylinders may be rebuilt.

A. Remove and clean the passages in the Bleeder valves. Then snugly tighten the Bleeder valve into its seat.

B. Coat the wheel cylinder pistons and cups with a light film of assembly fluid. Put the wheel cylinders together. Bolt the cylinder to the backing plate. Install the actuating pins inside the boots.

Figure 18 — Lubricate the parking brake cables and conduit with brake lube.

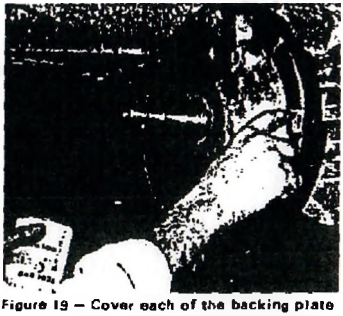

Figure 19 — Cover each of the backing plate ledges with a light coat of brake lubrication.

Step No. 18 -- Replacement of the Wheel Cylinder.

Unscrew front cylinders from brake hose. Be careful that the copper washer between the hose and cylinder is not lost. Disassemble the new cylinders and clean if necessary. Reassemble the cylinder with assembly fluid. Screw the new cylinder onto the brake hose firmly. Bolt the cylinder to the backing plate. If the brake hose has even the slightest twist, the hose clamp on the frame must be disconnected and the twist removed from the hose. A twisted hose will unscrew itself from the wheel cylinder as the car is driven, resulting in loss of all the brake fluid and the brakes.

Step No. 19 -- Disconnect the Rear Parking Brake Cables.

The rear parking brake cables can be maladjusted which will cause difficulty when installing the rear shoes. Many times when the vehicle driver complains that the parking brake handle travels too far when he applies the parking brake, an inexperienced mechanic will assume that the brake cables have stretched. He will "take up the slack" in the cable by shortening it. He should have: (1) pulled a rear brake drum and inspected the brake lining for excessive wear; (2) performed a minor adjustment to the rear brakes to bring the shoes closer to the drum; and (3) adjusted the cable for "slack" if needed. Shortening the cable without first checking the rear brake shoe adjustment will cause the rear shoes to be held away from the anchor pin. In some cases the drum will not go over the brake shoes.

Step No. 20 -- Lubricate the Parking Brake Cables.

Pull the cable toward the rear of the vehicle. Coat the exposed cable with brake lubricant. Pull the cable forward through the cable housing. Lubricate the forward section of the cable. Pull the cable in and out of the housing until the cable is completely free. If the cable does not move, it has rusted to the housing. Replace the cable with a new one.

Step No. 21 -- Lubricate the Backing Plate Ledges With a High Melting Point Lubricant.

The lubricant will keep the shoes from causing a scrunching noise as the brakes are applied. Do not apply too much; otherwise, the lubricant will bleed into the friction material on the shoe and cause erratic brake operation. When the vehicle has a brake design that uses an adjustable anchor pin, the anchor pin should be removed from the backing plate, lubricated, and reinstalled in the backing plate.

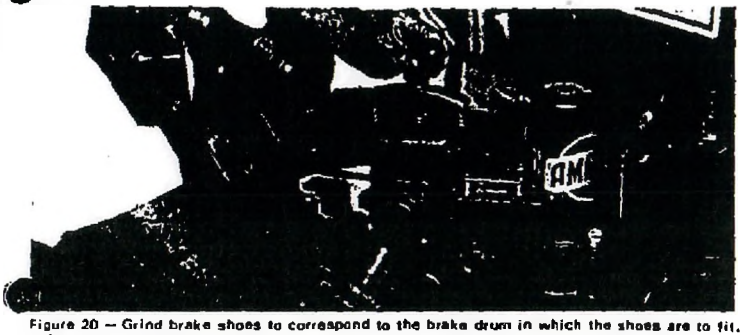

Figure 20 — Grind brake shoes to correspond to the brake drum in which the shoes are to fit. Since most all cars now have Servo brakes using a fixed anchor pin, the shoes should be ground to an anchor location.

Step No. 22 -- Obtain the New Shoes.

By using the make and model of the vehicle, find the shoes required for a particular vehicle in a brake shoe catalogue or a F.M.S.I. Brake Shoe Data Book. The first part of the shoe number indicates the F.M.S.I. (Friction Materials Standards Institute) number for the segments that are either bond or riveted to the core. The core is the steel part of the brake shoe. The last digits of the shoe number indicate the core number. For example, a 1968 Chevrolet rear brake will require a 2006-228 brake shoe. The No. 2006 indicates the lining segments. The No. 228 indicates the core number. If the drums were scored or out-of-round, they would have been machined oversize or larger than when the vehicle was new. The new shoes should have lining segments which are thicker than the standard (new vehicle brake lining thickness) shoes. A general rule to follow is to obtain brake shoes with over-size lining thickness equal to the amount removed from one side of the drum. If twenty thousands of an inch of material had been removed from one side of a brake drum, the brake lining should be at least twenty thousands of an inch thicker than the standard li at came on the vehicle when it was new. Most suppliers stock .030" ov e lining which would be the correct lining if the drum had been machin maximum safe diameter, or .060" greater than original equipment or sta drum size.

Figure 21 — Checking fit of ground shoe in drum.

Step No. 23 -- Grind Brake Shoes to Match the Drums.

Adjust the Brake Shoe Grinder so that the shoes will be ground to fit a dru that is slightly smaller than the drum into which the shoes are to fit. The

Figure 22 — Install the brake shoes with proper hold-down spring tool.

Figure 23 — Adjust Brake Shoe Setting Gauge to Drum diameter

Figure 24 — Rotate star wheel until gauge just slides by center of brake shoes.

Figure 25 — Clean drums with alcohol.

grinder is usually set to the drum size less .030". For example, if the drum diameter was 11.050" or .050" over-size, .030" would be subtracted from 11.050" which is 11.020". The shoes would be correctly ground for the 11.050" drum if the grinder is adjusted to 11.020". By grinding the brake shoe to a drum size smaller than the actual drum diameter, the shoe will touch the drum in its center. The ends of the shoe or the toe and the heel will have some clearance. When a shoe is held tightly against the drum in the middle, a .005" feeler gauge should go between the drum and each end of the lining segment. If a .005" feeler gauge will not slide between the end sho and the drum, the abrasive cloth on the Grinder should be replaced. If the shoes are for a vehicle having a Duo servo brake, the anchor pin determines how the rear or secondary shoe fits the drum. Obtain the anchor pin location for the Grinder by referring to a chart provided with the Grinder. Depending on the model number of the Grinder, gauge sleeves or gauge plates will be used to position an anchor pin on the Grinder in the same relative position as the anchor pin on the vehicle. Only grind enough material from the brake lining to insure proper fit of the shoe to the drum and to the anchor pin. Check the fit of the newly ground shoe in the drum. A .005" feeler gauge should slide easily between the ends of the shoe and the drum.

Step No. 24 -- Install all the Brake Shoes.

Correctly install all of the brake shoes on to the backing plates. Be sure that the springs are installed correctly. Usually the primary shoe return spring is installed on the anchor pin first.

Step No. 25 -- Adjust the Anchor Pins.

If the brake design has adjustable anchor pin, adjust the anchor pin to center the shoes to the drum.

Step No. 26 -- Adjust the Brake Shoe to Drum Cle

Use a gauge to adjust drum to shoe clearance o all brakes. Insert the gauge into the drum and adjust the inside caliper part of the gauge to the drum diameter. Put the outside caliper part of the gauge at the center of the shoe and horizontal to the floor.

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Expand the star wheel until the shoes just touch the gauge. The gauge is designed to automatically provide a drum-to-brake-shoe clearance of .010".

Step No. 27 -- Clean the Drums.

Wash the drums with clean alcohol to remove any trace of metal dust produced in the turning process. Also remove finger marks on the brake lining with clean alcohol.

Step No. 28 -- Pack the Front Wheel Bearings.

Pack the front wheel bearings with a good quality wheel bearing grease. A wheel bearing packer performs the job efficiently and quickly. Install two new seals in the front wheel hubs. Use a seal installer to properly seat the seal into the hub. Wipe a light film of grease on the front wheel spindle to allow the inner race of the wheel bearings to turn in respect to the spindle.

Figure 26 — Repack wheel bearing with pressure packer.

Figure 27 — Use a pressure Bleeder to force brake fluid to all the wheel cylinders.

Step No. 29 -- Install all Four Drums.

Some vehicles have left-hand wheel studs on the left side of the vehicle and right-hand studs on the right side of the vehicle. Care must be taken in order that the correct front hub is placed on the proper side of the vehicle.

Step No. 30 -- Bleed the Hydraulic System.

Figure 28 — Use a bleeder hose and bottle to conduct an efficient and clean brake system bleeding job.

Check the pressure Bleeder to see if it has enough brake fluid in it to perform the job. Some bleeder designs, especially those that connect to a tire to obtain the bleeding pressure, must be purged of the air that was induced into the bleeder when the bleeder was checked for fluid level. To accomplish this, squirt fluid into the master cylinder reservoir or the bleeder bottle until a solid stream of fluid results. Screw the proper adaptor to the top of the master cylinder reservoir. Check all wheel cylinder bleeder valves to make sure that they are closed. Connect the bleeder connector to the adaptor. Using a bleeder hose and bottle, bleed the left front cylinder until the

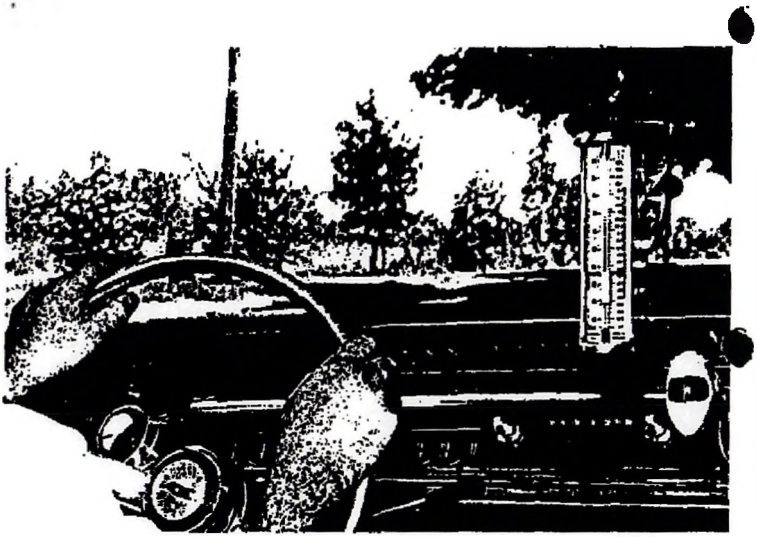

Figure 28A -- Brake Road Test. Periodic Vehicle Maintenance Inspection Programs are being developed in many states throughout the United States. One of the Brake Test Methods employed in P.V.M.I. Programs involves the use of a Decelerometer as shown above.

entering fluid makes no bubbles in the bottle. Then bleed the right front cylinder, then the left rear and finally the right rear. Disconnect the bleeder hose from the master cylinder adaptor, remove the adaptor and replace master cylinder cap.

Step No. 31 -- Put on the Wheels.

Install the wheel nuts in a manner that will not distort the brake drum.

Step No. 32 -- Check Brake Pedal Height.

After a complete brake job the car should be delivered to the owner, having a hard pedal and a stroke equal to at least one-half of the brake pedal travel that is available. If the pedal is low or spongy, the master cylinder probably needs rebuilding.

Step No. 33 -- Connect and Adjust the Parking Brake System.

When the parking brake pedal or handle is applied approximately 1/ of it's total travel both rear wheels should have the same resistance to turning or be locked. When the brake is released, the rear wheels should turn freely.

Step No. 34 -- Remove the Vehicle from the Stands or Hoists.

Step No. 35 -- Road Test the Vehicle.

HOW to perform the COMPLETE brake job

DISC BRAKE SECTION ...

HOW TO PERFORM THE COMPLETE DISC BRAKE JOB

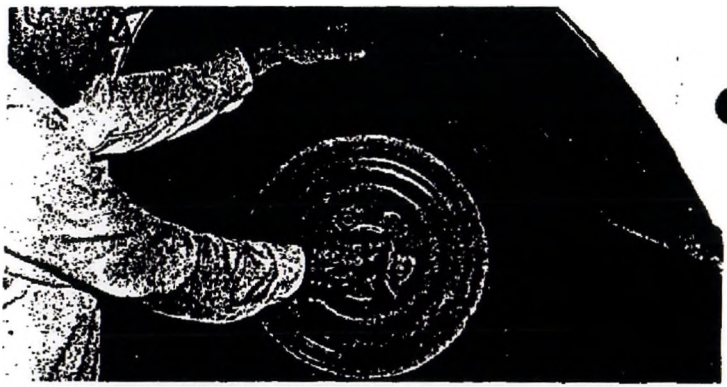

Figure 29 – Support the car on a hoist or jack stands. Mark a hub stud and its corresponding hole in the wheel to retain the wheel balance.

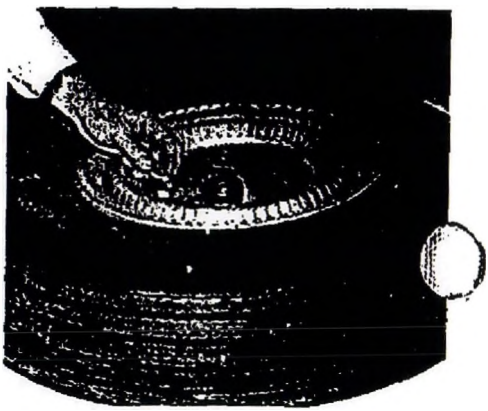

Figure 30 – Place the wheel, outer sidewall down on the floor. Put the hub cap inside the wheel. Put the brake parts into hub cap. Mark the Brake Disc L or R.

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Figure 31 – Remove the caliper splash shield retainer plate.

Figure 32 – Use two pliers to pull out Disc Brake Shoes because the shoes may be rusted into the caliper.

Figure 33 – Mark the location of each Disc Brake Shoe on rear of the shoe. Disc Brake Shoes wear thinner at one end than the other. The leading edge of the shoe wears more than the trailing edge causing the shoe to be tapered. If the shoes are to be reused, they must be marked and replaced in the same position as removed; otherwise, brake problems can result.

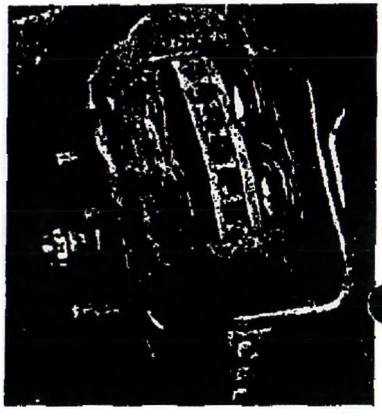

Figure 34 – After the shoes are removed from the caliper, the pistons are pushed into their cylinder bores by prying against the Brake Disc. If the pistons do not move freely, the caliper must be overhauled.

Figure 35 – Use hydraulic pressure, created by pushing on the brake pedal, to force the pistons out of their bores. A cover should be placed over the caliper to keep brake fluid from squirting onto the car. The pistons normally will not come completely out of their bores unless the Disc has been worn beyond factory specifications.

Additional fluid may have to be added to the master cylinder reservoir in order to push the pistons out against the face of the Brake Disc.

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Figure 36 -- The pistons are nearly out of their caliper bores. Now repeat steps shown in Figs. 29 thru 36 on the right front wheel. Then remove the rear brake drums and turn the drum having the largest diameter or which is most deeply scored on the Drum Lathe.

Figure 37 -- Remove caliper transfer tube from the caliper.

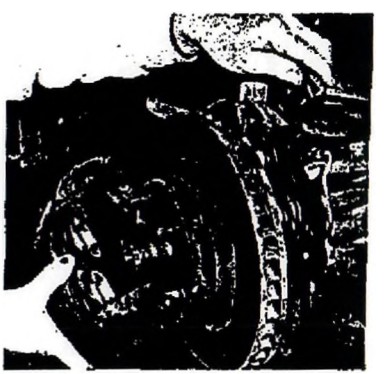


Figure 38 -- Remove caliper bridge bolts. These are special heat treated bolts. Do not substitute other bolts if the caliper bridge bolts are defective.

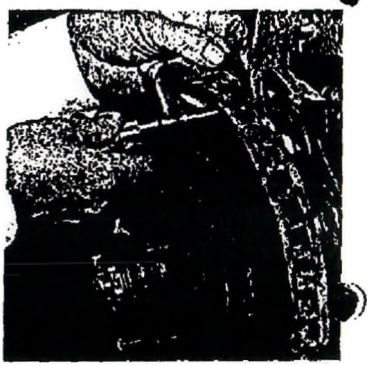


Figure 39 – Use an Outside Micrometer to determine if the Brake Disc has worn beyond manufacturers specifications. Also, check the Disc for thickness variation by measuring the Disc in three or more places about its circumference, about 1" in from outside circumference of the Disc.

Figure 40 – Install a Dial Indicator on the spindle. Locate the Indicator Anvil about 1" in from outer circumference of the Disc. Rotate the Disc slowly. Notice the maximum total indicated reading of the Indicator. If the T.I.R. is greater than factory specifications, the wheel bearing should be adjusted to specifications with a Torque Wrench. Determine whether the Disc should be resurfaced, reconditioned or replaced by the overall appearance of the Disc.

Figure 41 – Remove spindle nut safety washer and outer bearing cone. Screw on the spindle nut a few turns. Using the spindle nut as a stop, pull the Disc off the spindle sharply. This action will remove the inner bearing and seal from the hub. Inspect the bearing races thoroughly for pits and nicks.

H 0160

Figure 42 -- To remove a defective bearing cup or race, use a punch to drive the cup from the hub.

Figure 43 -- Do not drive the outer race into hub with a punch as the outer edge of the cup may be damaged. Drive cup flush with the hub face using a soft brass drift.

Figure 44 -- After both rear drums have been machined, install the Disc Brake Tool Bar on cross slide.

Figure 45 -- Mount Brake Disc on a 1" arbor with the Brake Disc Adaptors. These adaptors seat against the face of the lathe arbor and the edge of the bearing cup.

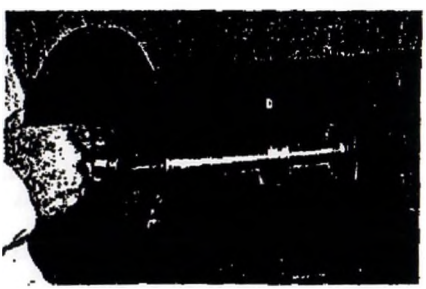


Figure 46 – Securely tighten arbor nut to firmly seat bearing cups. Additional 1" arbor spacers may be required if both inner and outer bearing cups are being pressed into the hub.

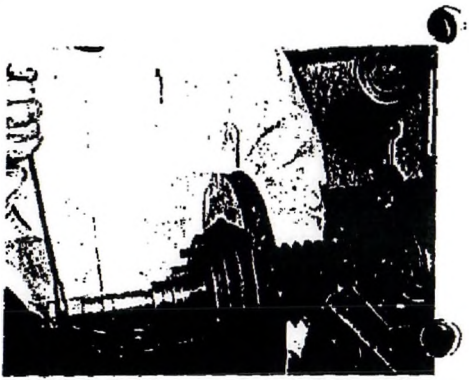


Figure 47 – Adjust the tool bar to conform to the Disc by sliding bar in tool holder. The outer edge of the Disc should just clear the tool holder.

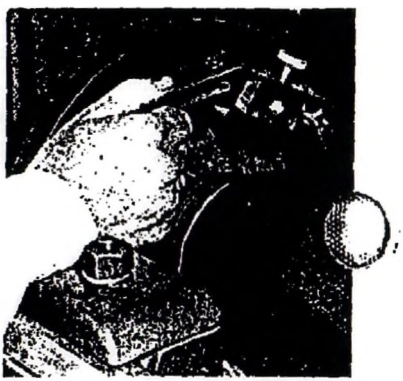


Figure 48 – The Magnetic Vibration Dampener is attached to the inner face of the Disc.

H 0191

Figure 49 — Bring the tool bit point against Disc at either the extreme inner diameter or maximum outer diameter. Let the tool bit lightly scratch the surface of the Disc as the Disc revolves. This position will be used as a starting reference point to determine the depth of cut.

Figure 50 — Mark the position of the scratch cut on Depth-Of-Cut Dial at the end of the lathe with a piece of chalk. Move cross slide with the hand wheel inward across face of Disc. Determine visually the deepest score in the Disc face. Turn the Infimatic Feed Handle clockwise until the tool bit is at the bottom of the deepest groove. Notice the number of marks that the Depth-Of-Cut Dial has moved from the first chalk mark. This determines the depth of the groove and indicates the amount that will have to be removed from the face of the Disc.

Figure 51 – Back the tool bit out of the deepest groove. Turn the cross slide hand wheel until the tool bit is at the smallest diameter of the Disc face. Turn the Depth-Of-Cut Hand Wheel (Infimatic Feed Handle) clockwise until the Depth-Of-Cut Dial has gone two marks or .004" beyond the deepest scratch cut mark. Lock the lead screw lock nut. If the lathe has a lead screw lock ring, rotate it to lock the lead screw.

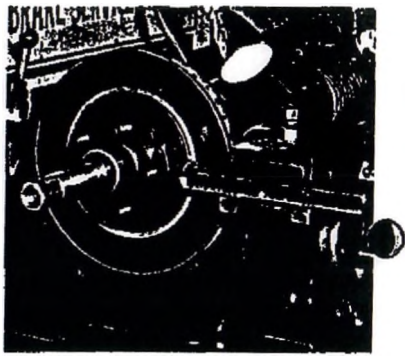


Figure 52 – Engage the Disc Brake Feed Mechanism by pulling the handle toward the machine. This will machine the Disc at the fast feed or .010" travel across the face of the Disc for each revolution of the lathe. Pushing the red knob away from the machine will turn the Disc at a slow feed or .002" travel across the face of the Disc for each revolution of the lathe.

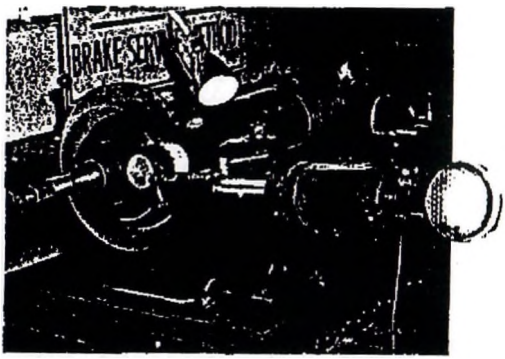


Figure 53 - The finish of the machined surface of the Disc will not be acceptable if the fast feed is used. A Disc Brake Grinder is then used to make the surface non-directional or remove the tool marks. The Disc Brake Grinder also provides an acceptable micro-finish to the Disc face.

Figure 54 – While the Disc is being machined, the caliper may be rebuilt. First remove the boots from their retainers. Later model calipers require that the pistons be removed before the boots.

Figure 55 – Identify each piston as to the caliper bore from which it was removed.

Figure 56 – Clamp outside half of caliper in a vise. Caution should be taken so that a critical area of the caliper is not damaged by the vise jaws. Remove and mark the pistons.

Figure 57 – Remove the piston seals with a small screwdriver. The screwdriver may be modified to facilitate removal of the seal.

Figure 58 – Visually inspect the seal retainers for nicks or burrs. Replace the retainer by prying the retainer from the boss of the caliper. Later model calipers do not have a separate retainer. The retainer is part of the caliper.

Figure 59 – Replace the boot retainer by using a special tool or use a round hardwood block or mallet head to seat the retainer on the boss.

Figure 60 – Use an electric drill and inspection hone to clean up the cylinder walls. Alcohol may be used as honing fluid. However, brake fluid could also be used.

Figure 61 – Clean the caliper cylinder bores with a clean shop cloth and alcohol.

H 0163

Figure 62 – Install the new piston seals into grooves of cylinder bore.

Figure 63 – Lubricate the wheel cylinder piston with brake fluid or wheel cylinder assembly fluid. Push piston into cylinder bore slowly being careful not to force the seal out of its groove.

Figure 64 – Install the new caliper piston boot. The large diameter of the seal fits around the seal retainer. The inner diameter of the seal fits into a groove in the outer edge of the piston. Later model calipers require that the boot and piston be installed at the same time.

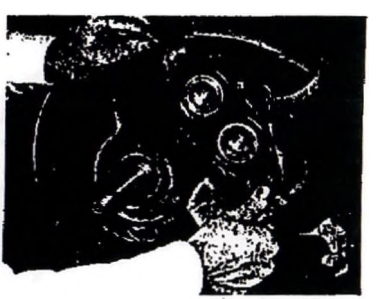


Figure 65 – Use fine emory cloth or 400 wet-or-dry paper to clean the mating surfaces of the caliper. Do not use a file. The mating surface must be accurate; otherwise, the caliper could be distorted when it is bolted together.

Figure 66 – Pack the wheel bearings with a good quality wheel bearing grease. Use a wheel bearing packer to insure that the grease is forced throughout the bearings.

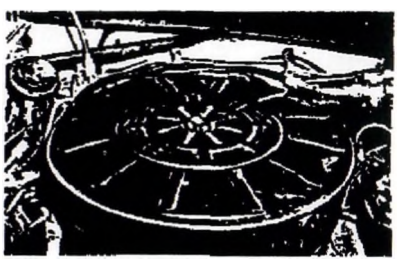
Figure 67 – Use a Torque Wrench to properly seat the bearing cups and force the new grease out of the bearing. This provides for an accurate adjustment of the bearings. Tighten the spindle nut to a torque of 30 ft. lbs. Then back off the spindle nut until the Disc is loose on the spindle. Then tighten the spindle nut finger tight. Replace the cotter key.

Figure 68 – Install the outer section of the caliper to the inner section with the caliper bridge bolts. Refer to the car factory specifications for the torque required to tighten the caliper bridge bolts. Tighten flare nuts on cross-over-tube with suitable wrench.

Figure 69 – Obtain the correct Disc Brake Shoe by using the F.M.S.I. (Friction Material Standard Institute) Number Identification. The F.M.S.I. Number of this shoe is S-728. If the old shoes are going to be reused, be sure to install the shoes in their former location.

Figure 70 – Install the splash shield correctly or the wheel may scrape on it.

Figure 71 – Install the proper Single or Dual Master Cylinder Bleeder Adaptor. Observe the warning caution on the cover stating that a special Disc Brake Fluid must be used.



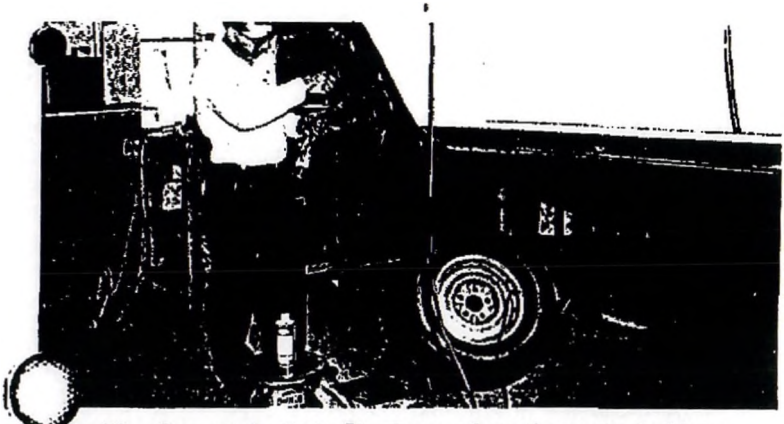


Figure 72 – Connect the Brake Bleeder to a front tire to obtain 30 lbs. of pressure. Open the Bleeder Valve on the Master Cylinder first, then bleed the LF, RF, LR and finally the RR Brake Assembly. Install the wheels. Apply the brake pedal a few times to insure proper brake operation before the car is moved.

DIAGNOSING BRAKE PROBLEMS

When a customer brings his car to the repair shop for Brake Service he probably has experienced a change in the operation of his car's brakes. There are a number of solutions to each particular Brake problem. The following list will outline a number of causes and fixes for each typical customer complaint. The brake problems covered occur when the brakes are applied.

LOW, HARD BRAKE PEDAL

Power Brake Unit not operating.	Before replacing Unit check vacuum lines.
Excessive drum to brake shoe clearance.	Minor adjustment or brake reline is required.
Self-adjusting brakes not working.	Inform the customer how the self-adjusting brake works.
Self-adjusting brake parts corroded or bent.	Lubricate star wheel. Replace brake operating lever if bent.
Thin, glazed cracked brake lining.	Replace brake lining.
Polished, glazed brake drum.	Machine brake drum on a lathe.
Dual master cylinder system has lost the fluid in either the front or rear brakes.	Repair warning light bulb. Repair hydraulic system.
Improperly adjusted parking brake.	Readjust parking brake.

LOW, SOFT SPONGY BRAKE PEDAL

Air in hydraulic system.	Refill master cylinder. Bleed system.
Defective residual check valve in master cylinder.	Rebuild or replace master cylinder.
Low or nearly empty master cylinder.	Find leak in system and bleed brakes.
Defective brake hose.	Replace brake hose and flush hydraulic system.
Unground or improperly ground brake shoes.	Regrind brake shoes to anchor and drum.
Oversize brake drums.	Replace brake drums.
Incorrect anchor pin adjustment.	Perform anchor pin adjustment.
Ridges on disc faces.	Machine or replace disc.

HIGH, HARD BRAKE PEDAL

Brake pedal push rod too long.	Adjust push rod to master cylinder piston clearance.
Self-adjusting brakes over-adjusting.	Consult car driver as to his use of brakes. Use a brake shoe adjusting tool to correctly preadjust the shoe to drum clearance.
Hard, glazed brake lining.	Replace brake lining.
Low friction brake lining.	Replace brake lining.
Disc brake caliper piston frozen.	Replace or rebuild caliper.
Power brake unit not working.	Replace power unit and readjust brake shoe to drum clearance.

BRAKE PEDAL PULSATION

[illegible]torted drum or disc.	Correctly install the wheel to the brake drum hub or disc.
Out-of-round drum.	Turn drum on brake lathe.
Not concentric drum, "wobbling" drum.	Turn drum on brake lathe with correct adaptors.
Brake disc has excessive runout.	Turn disc on brake lathe with disc brake adaptors.
Brake disc has variable thickness.	Turn disc on brake lathe with disc brake adaptors.

POWER BRAKE PEDAL DOES NOT DROP AS ENGINE IS STARTED

Reserve vacuum was not depleted from tank.	Pump brake pedal 5 times with engine "off" before testing brakes.
No vacuum to power brake unit.	Defective check valve. Collapsed vacuum hose.
[illegible]r unit defective.	Replace power brake unit.

CAR PULLS TO ONE SIDE AS BRAKES ARE APPLIED

Frozen wheel cylinder piston	Rebuild or replace wheel cylinder.
Restricted brake tube or hose	Replace brake tube or hose.
Brake shoes reversed or both secondary shoes are on one side of car.	Install brake shoes correctly.
Grease or brake fluid on the brake lining.	Replace or rebuild wheel cylinders. Replace axle seal.
Brake shoe springs improperly installed.	Clean springs and install according to color.
Brake shoes springs stretched or overheated.	Replace springs on all brake assemblies.
Brake shoes improperly ground.	Grind brake shoes to match drum diameter.
Loose wheel bearing.	Adjust wheel bearing correctly.
Vehicle out-of-alignment.	Realign vehicle.
[illegible] steering parts.	Replace idler arm, tie rod etc.
[illegible]ual tire pressure or tire size.	Match tire size and properly inflate tires.

DRAGGING BRAKES

Frozen wheel cylinder pistons.	Replace or rebuild wheel cylinder.
Stretched or fatigued shoe return springs.	Replace shoe return springs.
Master cylinder compensating port closed.	Adjust master cylinder push rod clearance or free play.
Disc brake master cylinder has check valve in line to disc brakes.	Rebuild or replace master cylinder without a static check valve.
Rear wheel parking brake cables frozen.	Replace or lubricate the parking brake cables.
Minor brake adjustment too tight.	Back-off star wheel at least 10 clicks.

BRAKE SQUEAK OR SQUEAL

Dirt embedded into lining.	Remove dirt from brake assembly and drum.
[illegible]glazed, cracked brake lining.	Grind brake shoes or replace brake.
[illegible], polished brake drums.	Turn brake drums.
[illegible]ed, overheated brake shoe return springs.	Replace springs.

BRAKE CHATTER

Grease or brake fluid on brake lining.	Replace brake shoes.
Brake shoes ground incorrectly.	Ground brake shoes should have .005 to .008 thousandths heel and toe clearance.
Loose backing plates.	Tighten backing plate bolts.
Excessive rear axle end play.	Adjust rear axle bearings to manufacturer's specifications.

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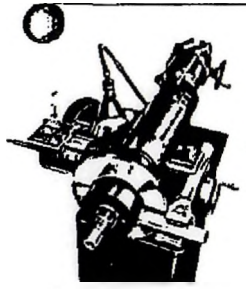
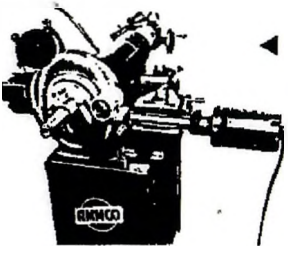
SOUTHEAST REGION
ALBERT S. GOODGAME
1311 Swims Valley Dr., N.W.
Atlanta, Georgia 30327
404/255-3358

BRAKE SERVICE equipment

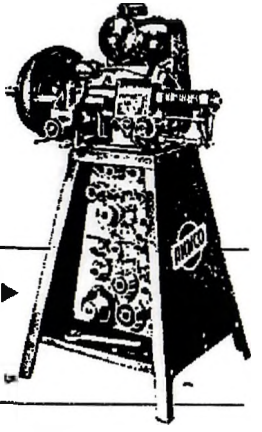
NO. 40 BRAKE SHOP
Includes Brake Lathe for machining brake drums and disc brake rotors and Brake Shoe Grinder to grind brake shoes to an arc to match the drums. Lathe design permits switching from drums to discs in a few seconds. Units mounted on mobile bench for easy portability.



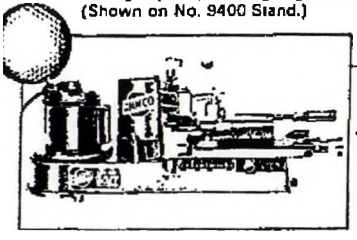
NO. 7750
BRAKE DISC
FACING SET
Permits fast, accurate machining of disc brake rotors. Can be installed on any Model 3000 Brake Drum Lathe. This set included in No. 40 Brake Shop.



MODEL 8350
"SAFE-SWIRL"
DISC BRAKE
ROTOR GRINDER
Used with Drum Lathe to provide non-directional swirl finish required by most factory specs.



MODEL 9000 BRAKE DRUM LATHE
Turns 6" to 16" dia. drums. Infinitely variable feed permits adjustments from .001" to .015". This allows maximum cutting capacity for roughing and finishing.
(Shown on No. 9400 Stand.)



MODEL 8000
BRAKE SHOE GRINDER
Assures correct arc of brake shoes to match the drum. Fast, automatically accurate.