



MASTER POWER BRAKES

110 Crosslake Park Road, Mooresville, NC 28117

Website: www.mpbrakes.com

Technical Support: 888-533-1199



WARNING

Proper operation of your brakes is essential for your safety and the safety of others. Any brake service should be performed **ONLY** by persons experienced in the installation and proper operation of brake systems. It is the responsibility of the person installing the component or kit for the particular application. After installation and before operating your vehicle, be sure to test the function of the brakes under controlled conditions.

→ **DO NOT DRIVE WITH UNTESTED BRAKES!** ←

FOR TECHNICAL ASSISTANCE CALL:

888-533-1199

MONDAY - FRIDAY

8:00 A.M. TO 5:00 P.M. E.S.T.

CHECK ORDER IMMEDIATELY WARRANTY INFORMATION

Take time to read all the literature that came with this kit. Check the provided list of parts against what you received to ensure all parts are present. While this kit was designed to make the process of changing brake parts as simple as possible, **with some kits it may be necessary to make minor changes to your car.**

Read all warranty disclaimers and return policies included in this kit prior to installation.

You have: **5 days** to declare shipping damages
30 days to declare missing or incorrect parts
90 days for exchanges or returns (RA req'd)
1 year before product warranty expires.

No exceptions allowed.

Thank you for your business!



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AC2004KZ Brake System Diagnostic Kit Instructions



INTRODUCTION

Master Power's new brake diagnostic tool kit is for troubleshooting your complete brake system. Eliminate guesswork and random brake parts swapping by using the measuring instruments included in this one package.

Master Cylinder / Power Booster Depth Gauge

This durable metal gauge is practically impossible to find in the automotive marketplace, yet is invaluable and critical for setting and measuring power booster and master cylinder operation.

Use it to precisely measure the depth of the master cylinder piston hole, and check the length of the power booster output pushrod, and ensure their optimum match-up and travel. Don't guess, make sure this critical dimension is within specification.

Vacuum Gauge

Power brake boosters require 18 in.Hg (inches of Mercury, vacuum) from an engine intake manifold source at idle RPM (in **Park**) to operate correctly, and with best power assist from the booster unit.

Use the vacuum gauge and its special DOT-approved hose to confirm the source of vacuum to the power booster is at the correct value. This test gauge will ensure that vacuum is sufficient and steady for a power brake system to fully operate.

Brake Fluid Pressure Testing

An accurate method to diagnose brake system operation is to measure the brake fluid hydraulic pressure at various junctions in the braking system. Without sufficient brake fluid hydraulic pressure (and volume), the brake system will not work, or partially apply the brakes. At best, much driving drama can result. At worst...let's not let that happen.

Fluid pressure readings eliminate guesswork, random brake parts swapping, and save you time. Measured pressure values quantify the brake system's operation all along its routing lines – from master cylinder to proportioning valves to metering blocks to dividing blocks to brake hoses out to the calipers or drums at each corner. The measurements are either within range or not, and then you can more easily pinpoint the inoperable or marginal portion of the brake system.

Two of the best places to take fluid pressure readings are at the bleeder port of the caliper (or wheel cylinder), and at the master cylinder output ports. So you can take these readings on a variety of common vehicles' braking systems, this diagnostic kit includes: a precise and calibrated pressure gauge (0—2000 psi: pounds per square inch); seven (7) brake caliper bleeder port fittings; color-coded master cylinder port adaptor tube lines; and assorted plugs and adaptor fittings.

With these in hand, you can tap into the brake system unions and measure the hydraulic operation from one end of the car to the other to make sure it is up to spec.

INSTRUCTIONS

Master Cylinder / Power Booster Depth Gauge

- 1) Separate the master cylinder and power booster. Place the master cylinder side of the tool (the short arms) on the master cylinder's mounting flange. Make sure to keep the two short arms flush against the flange. Now, slide the depth gauge rod's pointed end into the master cylinder piston's push rod hole until it bottoms. See accompanying photo.



- 2) Keeping the depth rod stable in the measured position from above, now reverse the gauge. Place the two long arms against the booster's mating face to the master cylinder. Check the clearance between the booster's output pushrod and the gauge's flat end. There should be 0.020-in. clearance. See accompanying photo, then adjust booster output rod as required.



Vacuum Gauge



A power brake booster **requires a minimum of 18-in.Hg** of intake manifold vacuum at engine idle (in **Park**) to operate at maximum efficiency and produce assist to the master cylinder. This value is specifically for Master Power power boosters, but applies to most factory stock ones, too. Most auto engines in standard tune will yield 17—21-in.Hg of manifold vacuum at idle RPM in **Park**, at sea level. As elevation increases, intake manifold vacuum decreases approximately 1.in.Hg for every 1000 ft. of elevation above sea level.

Engines in a higher state of tune; particularly when the camshaft has been replaced with a performance grind, will yield less intake manifold vacuum at idle – sometimes much less – as low as 10-in.Hg. Consequently, the power booster will not work, or operate very erratically, as vacuum supplied to it decreases.

To provide a constant 18—21-in.Hg of vacuum to a power booster in these hi-po engine cases, or if mainly driving at higher elevations, install Master Power's p/n AC2724K – vacuum pump kit.

Before doing the following steps and measuring intake manifold vacuum:

TAKE APPROPRIATE SAFETY MEASURES TO SECURE OR SUPPORT YOUR VEHICLE -- OR PERSONAL AND/OR PROPERTY DAMAGE WILL RESULT.

With the engine OFF, connect the vacuum gauge and its 11/32-in. DOT hose to an appropriate manifold port or tube. It must be large enough to securely fill the hose so there are no leaks.

This vacuum-source port must also be open to engine vacuum **below** the throttle blades, not above them. For the best measurement, attach the

vacuum gauge and hose to the same port the stock factory power booster uses for its manifold vacuum supply.

START the engine and measure the in.Hg reading on the vacuum gauge. If it is below 18-in.Hg, the power booster will not work properly, or erratically. STOP the engine and remove the gauge/hose, and then troubleshoot your engine vacuum source.

Cautions

Do not replace the supplied vacuum gauge's hose with fuel line or hydraulic hose – the attached hose is designed specifically, and DOT approved, for booster vacuum measurement – for example, it resists corrosive fumes and collapsing. The latter does not allow any vacuum assist.

Do not connect the vacuum gauge to a smaller vacuum hose than supplied, or to a line or port from the ignition distributor vacuum source, or carburetor, or EFI. These sources are typically not appropriate to operate a power booster and not useful to measure for this test.

Do not use fuel line or hydraulic hose, or thin-wall metal tubing to plumb the intake manifold to the power booster. These may deteriorate, or collapse over time and affect booster operation. Use only DOT-approved vacuum hose like we have included in this kit.

Brake Fluid Pressure Testing

Alert: A brake system with less than 500--600 psi pressure will not stop!

Disc brakes require more hydraulic fluid pressure to work than drum brakes. In general, disc brake calipers need at least 800 psi (pounds per square inch) or more, and drum brake wheel cylinders need 500 psi or more to operate correctly and reliably.

Your diagnostic kit includes a precise and calibrated 0—2000 psi gauge and assorted fittings for tapping into and measuring the brake system hydraulic pressure most anywhere in the full braking system: from the master cylinder to the calipers, or to the drums, and junction points between.

Seven (7) silver-colored caliper bleeder port fittings are included to fit a variety of brake calipers for measuring pressure at the caliper (or wheel cylinder) – the farthest point away from the master cylinder.

Typically, if the pressure value is adequate/correct at the caliper and will hold steady over time, then it will clamp well enough to stop/lock a wheel. If the pressure is valid, and the wheel will not stop/lock, then the problem is likely not pressure-related. Worn or incorrect brake pads/shoes or rotor issues should be the first suspects.

The 0—2000 psi pressure gauge screws directly into the appropriate caliper bleeder port fitting – no adaptor or brake line/hose is required.

Before doing the following steps and hydraulic pressure measurements:

TAKE APPROPRIATE SAFETY MEASURES TO SECURE OR SUPPORT YOUR VEHICLE -- OR PERSONAL AND/OR PROPERTY DAMAGE WILL RESULT.

In most cases, to measure brake fluid pressure at the calipers/drums, the vehicle will have to be supported, the wheels removed, and the vehicle eventually STARTED to check power booster assist operation, if applicable. You may have to turn the steering wheel to expose the front caliper(s) so you can more easily reach the bleeder and install the pressure gauge.

Caution: In some cases, you may have to remove the caliper from the wheel to be able to fit the pressure gauge in the bleeder hole and not foul it against front suspension parts.

If this is the case, you will have to support the caliper so the brake line/hose to it is not strained, and you will have to install a suitable non-compressible substitute for the rotor between the caliper's pads. This is so that when pressure is applied to the caliper for measuring, the pads are restrained and you don't damage the caliper's piston seals.

To confirm which silver caliper bleeder port fitting mates to your vehicle's caliper, use the correct wrench and remove the caliper's bleeder screw (save it!) and compare their threads side-by-side. Do not lose the caliper bleeder screw because you will reinstall it after testing and when you eventually bleed the brakes.

Once the correct caliper bleeder port fitting is selected, GENTLY FINGER-TIGHTEN IT BY HAND into the caliper's bleeder hole for a secure trial-fit. If it passes, then prepare to install the pressure gauge directly into the fitting and snug it in place.

Caution: Do not force the silver caliper bleeder port fitting into the caliper's threaded hole by wrenching it in place. You may cross-thread it and damage the fitting's threads if you're lucky, or the caliper's if you're not. The fitting should start in the caliper with minimal resistance and then can be tightened snug. If not, figure out why before proceeding.

Also, be careful not to cross-thread the male pressure gauge's NPT threads into the female bleeder port fitting. Snug the gauge in place by hand. You can sparingly use pipe tape on the gauge's threads to help seal it to the fitting. Pipe dope from a stick might flake off the threads and enter and contaminate the brake system – we don't recommend it.

Now snug the caliper fitting / gauge into the caliper body using the flats on the fitting to tighten with a correctly sized wrench. DO NOT USE THE GAUGE as a tightening tool. See the accompanying photo.



BE CAREFUL NOT TO OVERTIGHTEN the fitting into the caliper. This could damage the caliper or the fitting's threads. You want it tight enough not to leak brake fluid when the pedal is applied.

Testing At Caliper / Wheel Cylinder

You can start measuring pressure at the caliper or wheel cylinder farthest from the master cylinder, and then progress around the car. After installing the pressure gauge at the caliper, you may have lost a bit of brake fluid. Make sure that the master cylinder is topped off with fresh fluid and keep it that way throughout your pressure measurements.

If testing a manual brake system, have an assistant slowly apply the brake pedal by hand or by foot. **DO NOT** have the assistant vigorously pump the pedal multiple times in a row to build pressure.

Continue the slow application of the brake pedal and monitor the pressure gauge. If any part of the pressure fitting is leaking fluid, you will have to correct that before getting a valid pressure reading.

Observe and record the pressure reading at the caliper. Once any leaking is fixed, the assistant may have to apply the pedal a couple of times to stabilize the pressure reading at its highest level. If the pressure will not hold and begins to drop while the pedal is being steadily applied, the brake system is leaking. Find and correct the leak before proceeding.

If measuring 800 psi or more at the caliper (500 psi or more at a drum wheel cylinder), you can be reasonably certain all the brake parts “up stream” from the caliper to the master cylinder are working OK.

If testing a power booster-assisted brake system, follow all of the previous steps, and then have an assistant **START** the vehicle while in **Park** or **Neutral**; keep it at idle RPM; apply the brake pedal as before, and note the pressure measurement at the caliper and record it. **STOP** the engine between caliper readings.

Testing At Master Cylinder / Other Unions

Four color-coded brake adaptor lines are included in the kit. They and the assorted fittings and plugs are used to mate the pressure gauge to various master cylinder port(s), or proportioning valve, or distribution blocks included in the brake system.

You must use the included 3/16-in. inverted flare to 1/8-in. NPT (pipe thread) brass adaptor to join the pressure gauge to the appropriate color-coded brake adaptor lines. See accompanying photo.



The female NPT portion of the adaptor mates to the pressure gauge, and the female inverted flare portion mates to the brake adaptor line. Once again, trial-fit all fittings by hand before tightening.

Some technicians prefer to first measure the output pressures of a master cylinder's ports when troubleshooting a brake system. The logic is that if the source of the brakes system's hydraulic pressure (the master cylinder) is not measuring at spec, correct it first before proceeding "downstream" from the master cylinder.

Remember, trial-fit all tube and fitting connections before tightening so you don't foul the threads of a master cylinder, valve, or special fitting of the kit. To measure master cylinder output pressure, make sure it is topped off with brake fluid, and then begin by plugging one of the master cylinder's output ports, or capping the port's output line before it reaches a proportioning valve or metering or distribution block.

Measure the brake fluid output pressure directly from the other port by disconnecting its brake line and screwing in one of the color-coded brake line adaptor fittings plus pressure gauge in the port. Make sure all fittings are secure, and then using the brake pedal application technique from above

(slowly depressing it to build pressure), take the master cylinder's port output pressure. Repeat for the other port.

If the master cylinders ports' output pressures are within the specs noted above for disc and drum brakes, then you can proceed "downstream" of the master cylinder to isolate any pressure drops that could affect brake operation.

The important part is to confirm that brake fluid pressure is kept high enough all along the brake system to correctly operate it. When it drops on the "downstream" side of a brake system part – that part is suspect.

Don't assume – measure brake fluid pressure from master cylinder to caliper/wheel cylinder, and all points between, to quantify the brake system's operation.

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