

**GOT LSD? (Limited-Slip Differential – No, Not The Drug)**

Hi, Miata Folks,

Our Miatas have **open (standard/unlocked) differentials** or optional **limited slip differentials** (“LSD” in the automotive parlance) and I thought I’d give you a brief explanation of what the differential (diff) is, why it’s cool to have LSD and how to find out if your Miata has LSD if you’re not sure.

First things first, a little background: The **automotive differential** has three functions: it transfer power from the engine to the wheels, it varies this power so that the wheels may rotate independently (i.e., the term “differential”) and acts as the final gear reduction drive system for the drivetrain. If you peek under the rear of your Miata next time it’s jacked up, you will see a large metal “pumpkin”. That’s the diff. Now you’re in the know. ☺

There are “open”, “limited slip” and “locked” plus various sub-type differentials but we will mainly concern ourselves with the open (standard unlocked) and the LSD’s here. Locked diffs are rarely used on street cars, more for heavy-duty off-roading or racing applications.

**So... what is the difference between an open and a limited-slip and who really cares, you ask? Read on.....**

**Open Differential:**

When the differential is **open** (standard/unlocked differential), it allows each wheel to rotate at different speeds when negotiating a turn (the inside wheel rotates slower than the outside wheel) to avoid tire scuffing. The open diff always provides the same torque (rotational force) to each of the two wheels on the same axle. The purpose is to allow for different speeds between two wheels with torque split 50/50. If you hit a loose patch of snow, mud, gravel, rough road, etc., the open diff will send power to the slipping wheel. This will result in wheel spin on the loose patch side while the solid contact side barely moves and it’s easy for the driver to lose control in a spin. The majority of most passenger cars are equipped with open style diff but LSD’s are usually optional.

**LSD’s (limited-slip differential):**

LSD’s operate exactly opposite of an “open” diff system. When an LSD senses a wheel is spinning (mud, snow, grass, etc.) it will automatically transfer more power to the wheel that has more traction. BUT, these diffs will not transfer 100% of the power to one wheel and prevents excessive power from be allocated to one wheel and so keeps both wheels in powered rotation ensuring traction will not be limited to the wheel which can handle the minimum amount of power. The advantage is that these diffs send more torque to the slower-rotating wheel the

minute there is a speed difference between them. LSD's work well in most cars where power is needed reducing traction loss around turns which increases handling and reduces spin-outs.

In our "younger days" during the Muscle Car era of the 60's and 70's, these cars were at a distinct advantage with LSD over their wheel-spinning counterparts (you may remember the term "posi" for GM's "Posi-traction", Ford's "Traction-Lok, or Chrysler's "Sure-Grip"). There's several types of LSD commonly used in passenger cars, fixed value, torque sensitive (Torsen), speed sensitive, and electronically brake-controlled. The Beach Boys' song "409" lyrics refer to a General Motors LSD : "My four-speed, dual quad, Posi-traction 4-0-9". It was a big-block V-8 Chevy Impala SS, Bel-Air and or Biscayne, in case you were wondering what a 409 was.) ☺

### **So How Do I Know is I Have LSD?**

- Call Mazda Customer Service 1 (800) 222-5500. This is the simplest way, because all you need is the VIN number. But it's not always guaranteed that they will know if it had the limited-slip differential option.
- Do a burn-out (but not really recommended for obvious reasons, Folks): if you see one-wheel peel, you have an open (non-LSD) differential. If you see two skid marks, you have a LSD. Some people like to do one wheel on grass and the other on pavement and if you wheels spins in the grass you have an open differential.
- Is it an automatic? No Miata with an automatic transmission came with a limited-slip differential – sorry.
- Buy a 1994-1997 as in those years a limited-slip differential was standard equipment with the "A, B and C packages optional". The 1989 and up model years the limited-slip was an option and not standard equipment (Caveat: the 1994-1997 model years came with a Torsen (well-known brand name) LSD, but the earlier cars came with a viscous LSD. The merits of either is its own discussion not included here. Newer models now offer Tochigi-Fuju "torque-sensing" LSD, made by a Chinese company owned by a British Company. Go figure.)
- Recommended: jack up the rear of your car, chock the front wheels and place your transmission in "Neutral". Spin one of the rear tires with your hand. If the opposite tire spins in the same direction or doesn't move, you have LSD. Remember to place your car back in "Park" before removing the jack stands and lowering it off the jacks.

### **Differential Maintenance:**

Did you know Mazda and most manufacturers recommend the differential fluid be changed every 30,000 to 60,000 miles? It's messy like changing your oil but not difficult. It's important that the correct type and correct amount be added so best left to a mechanic unless you know what you're doing. Read your owner's manual in the maintenance section.

I hope you enjoyed this explanation. There will be a quiz on Monday.

Zoom Zoom Safely!

*Gail*

### **DISCLAIMER**

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